Vol. 1, No. 4, 2008
ISSN 0718-378X

REVISTA AIDIS

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

Abstracts
Vol. 1, No. 4

Con el patrocinio de:
INSTITUTO DE INGENIERÍA UNAM

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

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MICROBIOTA PRESENT IN A MINING WASTE, AS AN OPTION FOR MINE TAILING DAMS RESTAURATION

LA MICROBIOTA PRESENTE EN UN DESECHO MINERO,
COMO OPCIÓN DE RESTAURACIÓN DE JALES

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In Mexico, mining exploitation is a very important economic activity. Unfortunately, it generates large volumes of solid wastes (jales, from the Náhuatl word xalli, that means fine sands) that are disposed in mine tailing dams (presas de jales) and cover vast extensions of land, in which there is no vegetation. Mines are responsible for 65% of the industrial wastes produced in Mexico. The composition of the particulate matter from mine tailing dams varies depending on the existing mineral deposits. This study worked with tailings from a mine rich in iron pyrite in the State of Mexico, Mexico. The physicochemical characterization of the waste indicates that it is a compact particulate material without organic matter, with small water-retaining capacity and whose pH acidizes under atmospheric conditions (weather, biological and chemical phenomena or "weathering"). The lack of organic matter is crucial to explain the absence of any visible superficial microorganism growth in tailing samples to which water was added (and was not absorbed). The sowing of tailings in a series of liquid culture media indicated the presence of native biota, which under microscope observation showed different fungi and bacteria, which were tentatively identified through bioassays. Aspergillum nidulans, Helicosporium panacheum, Humicola alopallonella, Alternaria alternata and Cladobotryum mycophilum were isolated from the initial mixed cultures. Barr culture media showed the presence of sulfate-reducing anaerobic bacteria identified in the literature as Desulfovibrio desulfuricans. The decline of pH in the tailing, subject to weathering, indicates the presence of sulfur-oxidizing bacteria, assumption confirmed in the laboratory with the oxidation of the earth ion. It is, possibly, due to Acidithiobacillus ferrooxidans. When fragments of tailing were put on a culture of Aspergillus nidulans (native biota) it was observed that there was fungi growth on the free surface of the wastes. These results observed in laboratory scale led to the assumption that it is feasible to achieve colonization of the tailings by filamentous fungi present as native biota, if there is addition of moisture and nutrient. It is necessary, however, to confirm this statement through bioassays in a larger scale.

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BIOSOLIDS MANAGEMENT ACCOMPLISH DURING FIVE YEARS FOR BENEFICIAL REUSE IN SANTIAGO, CHILE.

GESTIÓN DE BIOSÓLIDOS REALIZADA POR CINCO AÑOS EN EL ÁMBITO DEL REUSO BENÉFICO EN SANTIAGO, CHILE

Paola Arata

Over the last five years, “Aguas Andinas” has developed experiments in the metropolitan region related to the beneficial reuse of biosolids (agriculture, forestation, reforestation of environmental assets, green areas and thermal valorization, among other things), with the purpose of minimizing their final disposal in sanitary landfills and/or monofills. These actions require gradual implementation because it is necessary to accomplish phases of testing in laboratory scale and subsequently in the field to gather information about the sustainability of each alternative studied before their implementation in real scale. Due to the quantity and quality of biosolids to be handled and managed by “Aguas Andinas” (early in next decade, approximately 1,000 tons of humid biosolids will be generated per day with 25% of solid contents), the studies performed in different fields of application and the results obtained determined alternatives to be implemented in a larger scale, such as the agricultural use, and others intended to complement the beneficial reuse, as the application of biosolids in green areas that will provide support for integral management actions. From the technical experiments and studies can be concluded that there are conditions for the agricultural reuse of biosolids in real scale in the metropolitan region, which is considered the most appropriate alternative in the medium and long term.

BIOSOLIDS VALORIZATION IN DEGRADED SOILS

VALORIZACIÓN DE BIOSÓLIDOS EN SUELOS DEGRADADOS

Alexis Araya Castillo

Advances in the sanitation of the watershed have taken place in the Metropolitan Region (MR) since the beginning of operation of large treatment plants. These processes generate a byproduct denominated biosolid; that is a stabilized sludge, it contains nutrients and organic matter and is an important source of essential elements for soils improvement and vegetal species development. The search of alternatives for biosolid handling and management indicates that agricultural valorization represents one of the most preferred options worldwide. Supported by this fact, this

work outlines the use of biosolids in degraded soils in a real operational scale in three agricultural properties in the Melipilla province, Santiago Metropolitan Region. Biosolids were transported and applied in the spring of 2006, before the start of the production cycle of the selected farms. Biosolids, soil and subsurface water were environmentally monitored until the subsequent harvest and analyses on the yield and operating procedures were carried out. The results obtained confirmed the feasibility of the use of biosolids in degraded soils. It was noticed a tendency in the rise of parameters in the soils such as organic matter, nitrogen, phosphorus and sulfur with regard to their original conditions. As regard subsurface waters, the amount of nutrients in the soil-water system did not present negative analytical impacts associated with the use of biosolids. For the yield of crops associated with biosolids, there was an increase from 30% to 70% in regard to the regular fertilization based on inorganic fertilizers.

RETENTION OF THE ZINC PRESENT IN WASTEWATER THROUGH A NON-CONVENTIONAL ADSORBENT DEVELOPED FROM INDUSTRIAL WASTE

RETENCIÓN DE ZINC PRESENTE EN AGUAS RESIDUALES MEDIANTE UN ADSORBENTE NO CONVENCIONAL DESARROLLADO A PARTIR DE RESIDUOS INDUSTRIALES

Srta. Lina Agouborde M
Dr. Rodrigo Navia D

The removal of zinc by brine mud (industrial waste) and sawdust (agricultural waste) was investigated by means of simple batch tests. Brine mud is mainly made up of NaCl (halite) and CaCO3 (calcite), the main cation exchangers being sodium (659.4 cmol+/kg) followed by calcium (12.1 cmol+/kg). The adsorption isotherms adjusted very well to the Langmuir model and the mixture presented maximum fixation values of 2,29 and 5.59 (mg/g) for the ratio adsorbent/solution 1:20 and 1:40, respectively. The main mechanism involved in the zinc removal in both materials is the ion exchange between sodium and calcium ions present in the brine mud and between H+ present in functional groups of sawdust.

AGGLOMERATE OF LEATHER SHAVINGS: THERMAL AND MECHANICAL PROPERTIES

AGLOMERADO DE VIRUTAS DE CUERO PROPIEDADES TÉRMICAS Y MECÁNICAS

Schneider Alfredo
Flores Hugo
Gunst Eduardo
Rodi Eduardo

This paper has the purpose of reporting the activity of the tanning industry in the country and its environmental impacts, with emphasis on the solid wastes known as “Wet Blue Shavings”. To add value to these wastes, this paper propose the production of an agglomerate to be employed as thermal insulator, using the shavings as load and the product of their hydrolysis as agglomerate. The purpose is to collect experimental data about the influence of the ratio load/adhesive used and the effect of the material moisture contents on its suitability as insulator. To this purpose, tensile and thermal conductivity tests were carried out under different conditions and their results and conclusions are related herewith.

PHYSICAL AND CHEMICAL EFFECTS OF USING DREGS ON INDUSTRIAL COMPOSTING OF SLUDGE FROM KRAFT PULP INDUSTRY

EFECTO DE LA UTILIZACIÓN DE DREGS EN ASPECTOS FÍSICOS Y QUÍMICOS EN EL COMPOSTAJE DE LODOS INDUSTRIALES PROVENIENTES DE LA INDUSTRIA DE CELULOSA KRAFT

Marcia Zambrano
Consuelo Pichún
Juanita Freer
Gladys Vidal
Jaime Baeza

The beneficial use of solid wastes could be an alternative for landfill management. However, there are few rigorous studies that have led to estimate the impact of these wastes on the environment. The most suitable combination of these wastes was studied based on a 32 factorial design and it was found that the dregs dose should not exceed 12.5% (v/v) with an optimal ratio of dregs:bark equal to 0.25. The results indicate that the process was successful and showed an evolution of its

typical temperature. Similarly, in most of the mixtures the termophilic temperature was exceeded. The tendency of N-NO3- and N-NH4+ contents indicated the existence of a mature compost, as well as seed germination rates.

DEVELOPMENT AND IMPLEMENTATION OF A NEW ADJUVANT-ORGANIC COAGULANT IN THE PROCESS OF COAGULATION- FLOCCULATION OF THE LEACHATE FROM A LANDFILL

DESARROLLO Y APLICACIÓN DE UN NUEVO COADYUVANTE-COAGULANTE ORGÁNICO EN EL PROCESO DE COAGULACIÓN-FLOCULACIÓN DEL LIXIVIADO DE UN RELLENO SANITARIO

José Ramón Laines Canepa
Randy Howard Adams Schroeder

The only alternative for the final disposal of solid wastes in Mexico is the sanitary landfill, but the leachate generated represents a water and soil contamination risk. This work had the purpose of determining the coagulation-flocculation potential of several mixtures made up of variable proportions of banana starch, aluminum sulfate and clays (LASA 55; LASA 73; LASAB 23530 and LASAR 23530). To evaluate the coagulation-flocculation effectiveness, controls were run with aluminum sulfate and ferric chloride. Leachate was pretreated and jar tests were performed, measuring control components as Turbidity, Color, Chemical Oxygen Demand (COD) Hydrogen Potential (pH), Total Suspended Solids (TSS) and Conductivity. Turbidity was reduced to less than 5 NTU with 75 mg/L in two treatments (LASA 55 and aluminum sulfate). The highest color removal was obtained with ferric chloride, followed by LASA 55 and aluminum sulfate, LASAB 23530 and LASA 73, the lowest being that with LASAR 23530. The mixtures based on starch plus aluminum sulfate showed a low COD removal and, in comparison with LASAR, the conventional coagulants presented a better removal. A very similar correlation was observed between TSS and conductivity. The results obtained in this work determined the feasibility of applying mixtures with coagulant properties for leachate treatment and for future tests in the treatment of industrial or municipal wastewaters.

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BIOLOGICAL TREATMENT OF AGROINDUSTRIAL'S WASTES FROM THE TEQUILA INDUSTRY WITH PHANEROCHAETE CHRYSOSPORIUM TO INCREASE ITS DIGESTIBILITY AS A SUPPLEMENT FEED FOR RUMINANTS

TRATAMIENTO BIOLÓGICO CON PHANEROCHAETE CHRYSOSPORIUM DE LOS RESIDUOS AGROINDUSTRIALES DE LA INDUSTRIA DEL TEQUILA, PARA EL AUMENTO DE SU DIGESTIBILIDAD COMO COMPLEMENTO DEL ALIMENTO DE RUMIANTES

Clementina Rita Ramírez Cortina
María de la Soledad Alonso Gutiérrez
Luc Rigal

The bagasse of the Agave Tequilana Weber, blue variety, an agroindustrial waste from the tequila industry was characterized by physicochemical analysis. Physical characteristics indicated that this waste is made up of an heterogeneous fibrous material and a non fibrous organic material in the shape of fine particles. The chemical analysis indicates that it contains 42% of cellulose, 14 %, of lignin, 18.5 % of hemicelluloses, 2.6 % of total nitrogen, 0.8 % of pectin, 1.2 % of oil and greases, 6.2 % of total reducing sugars, and 6.7 % of ashes. According to these analyses it was found that hemicelluloses, lignin and sugars can be used as a complement of animal feed by the reduction of lignin, and for this purpose the increase in digestibility of the agave bagasse was investigated by means of a biological treatment with the Phanerochaete chrysosporium fungus. The semi-solid fermentation was conducted at different humidity levels (20%, 60%, and 80%) and a temperature of 30°C. The sterilized bagasse underwent treatments that achieved a digestibility of 60% after 45 days. On the other hand, non-sterilized bagasse presented a digestibility of 55% after a 21 day-treatment. Untreated bagasse presented a digestibility of 36%.The optimal humidity for treatment was 80%.

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DESIGN OF A MANAGEMENT PLAN FOR SOLID WASTE GENERATED BY THE LIVESTOCK INDUSTRY IN THE MUNICIPALITY OF CHIHUAHUA, CHIHUAHUA, MEXICO

DISEÑO DE UN PLAN DE GESTIÓN PARA LOS RESIDUOS SÓLIDOS GENERADOS POR EL SECTOR GANADERO EN EL MUNICIPIO DE CHIHUAHUA, CHIHUAHUA, MÈXICO

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Alejandro Solís
Carmelo Pinedo
Luís Lozoya
Elizabeth Turcott

Animal production is one of the main activities practiced in Chihuahua area and other country states. During the past 50 years, this sector has experienced dramatic changes, as a consequence of a growing population, income increase and a progressive urbanization. According to the increase in the demand of animal products, It is expected that in this region animal origin food demand is going to double in size in two decades. This has ended in an increase in animal management practices under intensive confined systems with rare or null planning. The negative environmental impacts generated are more severe in countries with less availability of economic resources to maintain and use technology for the residue treatment. In the present study, it was established a plan and use of manure accumulated in farms, under total or partial confinement, with the purpose of being applied by the farmer and minimize environmental problems detected in the sector. It was used Landsat 7TM images and digital models of evaluation to locate areas and characterize their physical environmental conditions. It was applied questionnaires to know the conditions in which these activities are carried out; the production capacity of biogas/methane was estimated as a function of the organic material contained the amount of accumulated manure and the animal excretion rate. There were located a total of 25 places with 2224 farmers in a small scale established nearby the Municipality, the inventory consisted of 18962 heads which accumulates 57343.2 kg/day of manure, the plan proposed to the farmers shows corrective measures for the designs and location of corrals where the application of manure recollection, transport and disposal can be performed. Likewise, it is proposed a bio-methanization technology as the most viable way to make the most of manures from their content of total solids (ST), volatiles (SV), chemical oxygen demand (DQO), low metal content, and the area dry conditions. It is estimated that the anaerobic fermentation of the accumulated manure would generate, under optimum conditions, 6835 m3 day of biogas equivalent to 4785 m3 of methane daily.

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RECYCLING PROGRAM OF INORGANIC FRACTION OF MUNICIPAL WASTE APPLIED TO NUÑOA COMMUNITY, CHILE

PROGRAMA DE RECICLAJE DE LA FRACCIÓN INORGÁNICA DE RESIDUOS SÓLIDOS MUNICIPALES (FIRM), APLICADO A UNA COMUNA DE CHILE, ÑUÑOA

Andrea Allamand Puratić

This study reports the experience of waste valorization developed in the Ñuñoa Commune, in Santiago de Chile. The general objective is providing information on the Ñuñoa Program for Recycling (PROREÑU) the Inorganic Fraction of Municipal Waste and reporting the progress during its period of operation (2003 to 2007). The hypothesis proposed advocates that it is possible to implement a material valorization Program through the recycling of the inorganic fraction of municipal wastes in a Latin American country as Chile, and obtain positive social and environmental results, within the current legislative, environmental and cultural scenario. The work methodology includes two main sub-themes: Program Design and Citizen Participation Processes, in which explanatory images and tables are shown. The Program Design is comprised of three major points: Work Team, Selective Collection Model and Ecopark. The main stages and activities developed during these 4 years of operation are also detailed. The results obtained from the evaluation of the recycling Program are positive in relation to the levels of selective collection and citizen participation. Based on these findings, the hypothesis formulated is sustained and it is shown that if a recycling Program is well designed and takes into consideration the characteristics of the site, the existing collection of wastes and above all, the active involvement of the community, the expected results will be achieved. It is essential, however, to rely on political persuasion. The Commune underwent significant changes in its way of thinking and addressing the daily management of their wastes. Thanks to PROREÑU, the Ñuñoa community took progressive steps to maintain a clean Commune, to contribute to environmental preservation, and to set a national example of integral waste management.

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METHODOLOGY APPLIED IN A STUDY TO EVALUATE THE HEALTH RISKS OF SOLID WASTE DISPOSITION

METODOLOGIA EMPREGADA EM UM ESTUDO DE AVALIAÇÃO DO IMPACTO NA SAÚDE DA DISPOSIÇÃO AMBIENTAL DE RESÍDUOS SÓLIDOS

Mônica de Abreu Azevedo
Valdir Schalch

There are few studies that associate the environmental disposal of solid wastes with public health. To better explain the relationship between the final disposal of urban solid wastes and their influence on public health, this paper presents a methodology applied in a cross-sectional epidemiological study to evaluate the health risk to the population near Bandeirantes Landfill, located in Perus District, in the city of São Paulo, State of São Paulo, Brazil. Bandeirantes Landfill receives approximately 6,000 tons of Class IIA and IIB solid wastes on a daily basis. The landfill covers a total area of 1,400,000 m2 and contains approximately 33 million tons of waste. The risks to public health were evaluated among the resident population subject of this study, comprised of 972 children with ages ranging from one to five years old. The area of the study was divided into sectors 500-m distant from the landfill boundaries for determination of exposure conditions. The prevalence of diarrheal and parasitic diseases, longitudinal prevalence of diarrhea and anthropometric indexes were used as health indicators. A survey on the environmental quality was carried out in the area studied in order to correlate the environmental impacts caused by the final disposal to the health indicators used. The methodology applied proved to be appropriate to evaluate the correlations, subject of this work, and may be used in similar studies intended to evaluate the impact of the environmental disposal of solid wastes on public health.

IMPLEMENTATION OF SELECTIVE COLLECTION OF SOLID WASTES IN VALE CAMPUS AND ENVIRONMENTAL MANAGEMENT IN FEDERAL UNIVERSITY OF RIO GRANDE DO SUL

IMPLANTAÇÃO DA COLETA SELETIVA DOS RESÍDUOS SÓLIDOS DO CAMPUS DO VALE E A GESTÃO AMBIENTAL DA UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

Darci Barnech Campani
Rui Paulo Dias Muniz
Márcia Regina Pereira Tavares

In compliance with Federal and Municipal Legislations, the Federal University of Rio Grande do Sul – UFRGS implemented the selective collection of its wastes under the Environmental Management System Implementation Program. The collection was set up through a cooperation agreement between the city of Viamão and Passo Dorneles Ecologic Association to promote the development and performance of joint actions for the appropriate collection, destination and separation of recyclable solid wastes originated in UFRGS Vale Campus, with the purpose of generating income for the Association members and, in a broader sense, encouraging the sustainable development and preservation of the environment. Today, as a result of the Program, approximately 20 tons per month of recyclable materials from the UFRGS Vale Campus are destined to the Association.

EVAPORATION OF LEACHATE PRODUCED IN A LANDFILL IN RIO DE JANEIRO AS AN ALTERNATIVE TREATMENT TECHNOLOGY

EVAPORAÇÃO DE LIXIVIADO PRODUZIDO EM ATERRO SANITÁRIO DO RIO DE JANEIRO COMO ALTERNATIVA TECNOLÓGICA DE TRATAMENTO

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Lana Gopfert
Lúcio Vianna Alves

José Henrique Penido Monteiro

The selection of the appropriate technology for leachate treatment should be based on a careful evaluation of technical and economic parameters, since these wastes present high pollutant loads. Evaporation is a technological treatment option because it allows a reduction in the leachate volume of up to 70% and uses the gas generated in the landfill as an energy source, and therefore can qualify these facilities to obtain carbon credits. However, this treatment process generates two types of wastes (viscous and gaseous) whose composition requires in-depth studies. Companhia Municipal de Limpeza Urbana (COMLURB), the company that manages the solid wastes in the State of Rio de Janeiro, Brazil, developed an evaporation equipment called Unit Evaporator (EU).This equipment operates with a continuous feeding of leachate and can be installed near biogas collection wells in sanitary landfills. In this context, this work has the purpose of evaluating the evaporation of leachate through the EU and the characteristics of the wastes generated. The study was developed in two distinct phases: (1) conduction of evaporation bench-scale tests; (2) Operation of the EU prototype installed in Gramacho sanitary landfill. The following results are noteworthy: (a) the raw leachate from Gramacho landfill presented a significant variation of physicochemical characteristics and low ratio BOD/COD (0.12), making its treatment difficult by biological processes; (b) the GEM 2000 equipment determined that the biogas quality was consistent with the values typically found in literature. The biogas used as energy source by the EU was made up of 56.6% of CH4, 40% of O2, and 3.4% of other substances; (c) EU output, monitored in the field reached an average of 27.4 L/h. The decrease in the EU performance at the end of an operational period was considered an indication of the need for internal cleaning; (d) the viscous waste generated at evaporation in the bench test was characterized by the increase in pH (10.0) and build-up of organic matter (9,493 mg DQO/L). Condensed fumes presented high values of ammonia (3.481 mg NH4/L) and pH (9,0), and low concentrations of solids and organic matter; (e) wastes generated in the EU presented the following characteristics: high pH and COD values in the waste 1 (viscous), low ammonia concentration in the condensate because of the difficulty to contain this contaminant in the sample due to field environmental conditions. Waste 2 (solid) was characterized by a high COD and ammonia concentrations, significant decrease in pH, specific weight of 973.4 kg/m3 and a ratio of 1.94 m3 of evaporated leachate for an output of 1 kg of this waste.

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CHARACTERIZATION OF BIOGAS GENERATED IN FINAL DISPOSAL SITES OF URBAN SOLID WASTES SELECTED IN THE CENTER ZONE OF MEXICO

CARACTERIZACIÓN DEL BIOGÁS GENERADO EN SITIOS DE DISPOSICIÒN FINAL DE RESIDUOS SÓLIDOS ÚRBANOS EN LUGARES SELECCIONADOS DE LA ZONA CENTRO MÉXICO

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Sergio Flores
Guillermo Encarnación
Gustavo Solórzano

The results of the characterization of biogas generated in 13 final disposal sites of urban solid wastes in México showed uniform data relative to methane and carbon dioxide concentrations, with average values between 50% and 60% of CH4, and between 35% and 45% of CO2, in all sites, with slight ranges in percentage for each site. As regards nitrogen, its concentrations showed higher differences partly caused by the presence of air among the disposed wastes and elsewhere by probable differences in the waste composition, considering the original nitrogen content in the organic fraction. Oxygen concentration in the samples were very low and in several sites they fell below the equipment detection limit, which indicated that waste ages are higher than the necessary time to consume all the oxygen in the air trapped inside the cells, but, on the other hand, proved the insulation efficiency of the covering layers. As regards total methane and carbon dioxide emissions—considering the biogas flows measured—it was found that sites with larger methane production are generally the larger producers of carbon dioxide. The results show trends that lead to the interpretation that the sites with larger greenhouse gas production are the oldest sites and/or are managed as sanitary landfills with sufficient compaction and appropriate covering of the disposed wastes. Nevertheless, equivalent CO2 emissions are considerably lower in sites were biogas is burned. Finally it was found that most of sanitary landfills have lower emissions of greenhouse gases, at least in relation to the size of the site and the quantity of the disposed wastes.

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ENVIRONMENTAL VOLUNTARY COMMITMENTS, AN INSTRUMENT TO SUPPORT URBAN SOLID WASTE MANAGEMENT

COMPROMISOS AMBIENTALES VOLUNTARIOS, UN INSTRUMENTO DE APOYO A LA GESTION DE LOS RESIDUOS SÓLIDOS URBANOS

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Chilean companies that intend to develop projects that may affect the environment should submit the activities of the project life-cycle and the measures for mitigation compensation or reclamation of these environmental impacts to an evaluation process, in which the competent authority verifies its environmental feasibility. This process starts with the submission of an environmental impact statement or an environmental impact study (EIS). In this context of social and environmental responsibility, some companies decide to make voluntary environmental commitments as members of the community where the project or activity is taking place, with the purpose of contributing to the solution of a problem that although has not yet arisen from the performance of the project, may affect them in the future. This article reports the experience of voluntary environmental commitments, proposed within the framework of the EIS by a private company as an effective management tool to submit appropriate technical solutions to improve the solid waste management in a Commune in the north of Chile. To address the problem of the final disposal of solid wastes generated by the Caldera commune, it was necessary to collect available information, generate technical data and hold periodical meetings with different public and private entities, which led to the proposal of a technical solution through an engineering project that can be submitted to public or private financial agents. After completion of the work, it was concluded that the voluntary environmental commitments intended to benefit the community are a feasible tool to face environmental problems. This instrument provides a basis for cooperation and association in which commitments are made by public and private entities involved.

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SOCIOECONOMIC ASSESSMENT OF URBAN SOLID WASTES OF THE CITY OF CAMPINA GRANDE/PB

VALORAÇÃO SOCIOECONÔMICA DOS RESÍDUOS SÓLIDOS URBANOS DA CIDADE DE CAMPINA GRANDE/PB

Suellen Silva Pereira
Josandra Araújo Barreto de Melo

Within the context of the current socioeconomic crisis in Brazil over the last years, the separation and collection of recyclable materials have become a growing “market”. This market gave rise to the expansion of informal labor and scavenging (catação) of solid wastes, activity developed, most of the times, in the waste dumps scattered throughout the Brazilian municipalities, as in the city of Campina Grande, State of Pernambuco. The aim of this paper is to evaluate the contribution of the scavenging activity to the community socioeconomy that lives around Campina Grande Waste Dump. To carry out this work, data were collected on the daily waste production in the city and interviews were conducted with the waste pickers (catadores). It was found that the activity under analysis is important for the subsistence of the community and cannot be ignored, for that reason an urgent intervention is necessary not only to pay the debt of the government and society to these workers , but also to recognize their relevance on the environment and their economic contribution to the municipality.

DESCRIPTION OF THE BEHAVIOR OF EARTHWORMS POPULATION AS AN INDICATOR OF THE QUALITY OF VERMICOMPOSTING OF SOLID ORGANIC WASTE

DESCRIÇÃO DO COMPORTAMENTO DE POPULAÇÕES DE MINHOCAS COMO INDICADOR DA QUALIDADE DA VERMICOMPOSTAGEM DE RESÍDUOS SÓLIDOS ORGÂNICOS

Hiram Jackson Ferreira Sartori

Vermicomposting technique was applied in an experimental manner to select raw materials and control parameters that allow its improvement and adoption as a solid waste treatment technique. The research was conducted by the application of the process on identical beds filled with different substrates. The substrates used were obtained from different mixture ratios of the organic fraction of urban solid wastes, organic compounds of urban solid wastes, sawdust, straw and cattle manure. The materials were analyzed for their grain size and nutritional and microbiological characteristics, before and after being subject to the vermicomposting process. The vermicomposting process of the mixtures used behaved partly as an earthworm cultivation process, partly as a composting process. In relation to vermicomposting, the most variable parameters among the beds were the quantity of green cocoons and the percentage of adult individuals, which represented two extremes of the evolution cycle of these organisms and, due to this reason, the high coefficients of variation associated with their values reflect the fact that the earthworm population in each bed was, during their harvest, in a very specific moment of their reproduction cycle, entirely or partly adapted to the substrate in which they were applied. It is worth mentioning that the highest coefficient of variation was the one associated with the quantity of green cocoons, whose presence indicated the start of a new reproduction cycle. The ratio number of youngsters:number of adults that reflects the structure of the population, varies according to the season and the earthworm species, factors that remained constant in all beds during the whole experiment and, therefore, the variation noticed should reflect the environmental differences existing among the beds. After determinations of pH, weighting and distribution of earthworms per age group it was found that the higher the pH, the higher the ratio number of youngsters:number of adults, which shows that vermicomposting may be managed by the interpretation of the variation of control parameters values normally used in both mentioned processes.

EFFECT OF RECIRCULATION OF TREATY LEACHATE IN LANDFILL BEHAVIOR

EFECTO DE LA RECIRCULACIÓN DE LIXIVIADO TRATADO EN EL COMPORTAMIENTO DEL RELLENO SANITARIO

María Cristina Schiappacasse
Rolando Chamy
Paola Poirrier

In Latin America, urban solid wastes (USW) are mostly disposed in sanitary landfills that have the disadvantage of slow organic matter stabilization. The behavior of two sanitary landfills was

monitored in a pre-pilot scale with the purpose of evaluating the effect of the recirculation of anaerobically treated leachate on their velocities of settlement. Both landfills were initially loaded with 0.5 tons of USW, one operating with a recirculation of leachate treated in an anaerobic filter and the other with a recirculation of untreated leachate, with estimated stabilization times of 3.7 and 13.3 years, respectively. Considering the good results obtained in the pre-pilot scale with the recirculation of treated leachate, this same study was conducted in a pilot scale in a sanitary landfill initially loaded with 1,440 tons of USW. It was found that the average velocity of settlement doubles during the periods of recirculation of the treated leachate in relation to the landfills in which there is no recirculation of leachate. It can be concluded that it is possible to reduce the stabilization time by approximately 40% if untreated leachate is recirculated and by approximately 80% if this leachate is first anaerobically treated.

IDENTIFICATION OF CDM OPTIONS FOR EMISSION REDUCTION IN SANITARY LANDFILLS IN ECUADOR

IDENTIFICACIÓN DE OPCIONES MDL POR LA REDUCCIÓN DE EMISIONES EN LA GESTIÓN DE RESIDUOS SÓLIDOS URBANOS EN EL ECUADOR

Francisco de la Torre

This paper intends, through the analysis of the application of CDM - Clean evelopment Mechanism - Projects, to identify a complementary tool that not only controls gas emissions from sanitary landfills, but is also able to overcome obstacles that prevent different Ecuadorian municipalities from performing an integral management of the solid wastes under their jurisdictions. The first phase started with a brief analysis of the current situation of the solid waste sector and the second phase defined the options for application of CDM in the different Ecuadorian municipalities. Preliminary projections of gas emissions from sanitary landfills were carried out using the LandGEM – Landfill Gas Emissions Model, Version 3.02 of the Environmental Protection Agency – EPA. The results led to the conclusion that few sanitary landfills in Ecuador have opportunities to include CDM projects and, therefore, the following options should be analyzed: (i) Organization of Partnerships/Associations; (ii) Technical closing of waste dumps; (iii) Composting projects. Composting is the aerobic process developed during decomposition of organic solid waste for the production of composts that eliminates the generation of methane gas in sanitary landfills caused by anaerobic decomposition. Conclusions and recommendations are the following: There are prospects for the development of CDM projects in the urban solid waste sector in Ecuador, but they will be limited if alternative strategies are not applied. Studies of CDM projects should be developed under the PIN – Project Idea Note to determine the interest of the risk capital market in

Ecuador. Expectations should not be raised in medium and small municipalities about the advantages of the application of these CDM projects. It is recommended that the national policy provides the support of experts to the municipalities through their associations.

RISK EVALUATION IN WASTE DUMPS

EVALUACIÓN DE RIESGOS EN BASURALES

Alejandro Claudio Manuel Dos Santos
Gustavo Alejandro Vázquez

The society as a whole is increasingly concerned with the current and future environmental conditions. Not surprising, the aspects that analyze the environmental reality are included among the usual life quality indicators. Human activities generate impacts. The magnitude of these impacts on the environment has increased due to several factors, the most significant of them are the population growth, unevenly scattered throughout the territory and the technological advances characterized by unsustainable production and consumption standards. These widely disseminated factors in Latin America are associated with a regional framework in which strategic planning is not a part of the public administration culture. In this context, waste dumps are a symbol of disregard that represents the lack of planning, the discontinued management and the inadequate allocation of resources relative to solid wastes. This paper proposes a methodology that outlines the gradual application of these resources, but at the same time, maintains the consistent improvement of this scenario.

COMPARATIVE ANALYSIS OF ENVIRONMENTAL COSTS ASSOCIATED WITH THE MANAGEMENT OF SOLID WASTE AT TWO HOSPITALS IN THE REGION OF SERRA GAUCHA, BRAZIL.

ANÁLISE COMPARATIVA DOS CUSTOS AMBIENTAIS RELACIONADOS AO GERENCIAMENTO DE RSSS EM DOIS HOSPITAIS DA REGIÃO DA SERRA GAÚCHA - BRASIL

Vania Elisabete Schneider
Fernando Ben
Aline Brum de Carvalho

The specific characteristics of hospital organizations, the limitation of financial resources in the public sector and the tendency in the rise of health expenses, require the adoption of management models that satisfactory responds to the demands of the society for a better quality and wider coverage of health services. The use of information on costs to support hospital managers in the accomplishment of their managerial mission, in line with limited financial resources, is a target that can beachieved through environmental costs. Costs related to the management of wastes generated by medical services have not been accurately investigated, leading to a lack of information in this field, fundamental for decision-making. This study was developed in two Hospitals in the municipality of Caxias do Sul, State of Rio Grande do Sul, Brazil and surveyed their total environmental cost, which includes costs of environmental activities, waste collection, treatment and external disposal and environmental-related taxes. The Activity Based Cost – ABC was used to analyze the costs included in the management system. The most expensive environmental activity was the waste separation, due to the human resources and different materials involved in this stage in both hospitals. It was verified that although the supply of services is similar, the private hospital funded by SUS (Brazilian Unified Health System) has an additional cost of US$ 0.35 per patient to manage their wastes in relation to the public hospital, and that the treatment by the generation source, taken into consideration the situations analyzed, is more economically and environmentally advantageous.

COMMUNICATION AND DIALOGUE BETWEEN STAKEHOLDERS IN THE CONTEXT OF CO-PROCESSING: COSTA RICA AND EL SALVADOR

COMUNICACIÓN Y DIÁLOGOS ENTRE ACTORES SOCIALES EN EL CONTEXTO DEL CO-PROCESAMIENTO: COSTA RICA Y EL SALVADOR

Sandra Spies

Helga Arroyo ArayaCo-processing of industrial wastes in cement kilns is a technology that stands out as a feasible option to solve the problem of industrial wastes. However, the sustainability of the co-processing extensively depends on the communications and discussions among the stakeholders involved, which should ensure maximum participation, information and transparency. In this context, a research is proposed in order to analyze the communication and

discussion between stakeholders within the coprocessing scenario of Costa Rica and El Salvador. This is a descriptive and exploratory study that uses the structured interview technique as a main strategy to collect information. In the case of Costa Rica, the data collection technique was applied to 46 representatives of several sectors involved in integral waste management (IWM), whereas in the case of El Salvador, 18 participants were interviewed. The trend in the use of co-processing technology is different in each country. In Costa Rica it has being implemented since 2004, whereas in El Salvador the technology has been recently approved. This situation indicates that each country has different strategies of communication among stakeholders. The exchange of information not only contributes to the definition of theoretical communication models but also allows the improvement of experiences on discussions about co-processing among stakeholders.

COMPARISON BETWEEN THE USE OF DIFFERENT ORGANIC WASTES IN THE TREATMENT OF HAZARDOUS WASTES CONTAMINATED WITH CR(VI)

COMPARACIÓN DEL USO DE RESIDUOS ORGÁNICOS EN EL TRATAMIENTO DE RESIDUOS PELIGROSOS CONTAMINADOS CON CROMO HEXAVALENTE

David Alejandro de la Rosa Pérez
Juan Antonio Velasco Trejo
Marta Elena Ramírez Islas
Winfried Schmidt

This paper describes the results of the research on different treatment techniques for Cr(VI)-contaminated wastes, based on the stabilization by reduction to Cr(III). The reduction of Cr(VI) was performed by the application of organic wastes as reducing agents (tested in different mixture ratios) such as leachate from urban solid waste disposal sites, wastewater treatment plant sludge, whey, agave tequilana bagasse, citric wastes and green waste compost. The hazardous waste sample used in the research, was extracted from the abandoned site of the former plant “Cromatos de México”, was adjusted to the particle size and analyzed for physicochemical characteristics and Cr(VI) concentration. Test results showed that the reducing agents evaluated presented different capacities of reducing Cr(VI), with better results in mixture ratios of 1. Reduction efficiency varied from 84% for citric wastes to 7% for leachate. One of the advantages of using organic wastes as reducing agents is they are generally less toxic and can be cheaper than the inorganic reactives. The disadvantage is the reduction efficiency of the organic compounds is lower and their use may increase the waste mass, as in the specific case of citric wastes that increases the mass up to 35%. The work concluded that there are different alternatives of Cr(VI) reduction. However, due to the magnitude of the contamination (quantity and concentration) in Cromatos de México site, the application of one of these above mentioned technologies is not

feasible in technical terms. The alternatives suggested are feasible only if applied to soils contaminated by Cr(VI) in concentrations below 12,000 ppm.

CARBON CREDITS OBTAINMENT USING CHILEAN BIOGAS COMBUSTION PLANTS

OBTENCIÓN DE BONOS DE CARBONO MEDIANTE ESTACIONES DE COMBUSTIÓN DE BIOGÁS DE FABRICACIÓN CHILENA

Jean-François Bradfer

Biogas Combustion Plants constructed by AS&D Consultores are not conventional and their design is innovative worldwide. They are comprised of a biogas extraction plant, a measurement plant and finally combustion and heat dissipation chambers (bioflares); all facilities being controlled and run from an operation room. Flares used are based on air stream flares specially adapted to biogas requirements, with combustion outputs over 99%.

Due to the success achieved after the construction of the first biogas combustion plant in July 2006 (R.S. El Molle – 2,400 m3/h), Chile became a technological competitor in the international market with the implementation of the second largest project in the country (R.S. Santa Marta – 3,000 m3/h), ahead of North-American and European companies, which have been operating in this field for decades. Nevertheless, multiple reviews conducted in 2006 on the design methodology of biogas combustion plants and specially the “Tool for Calculation of Methane Destruction Efficiency”, led to the appearance of peculiar conditions and limitations whose aspects do not seem to be based on technical or environmental reasons, but rather on technological barriers imposed by countries responsible for paying carbon credits.

ANALYSIS OF THE ENVIRONMENTAL IMPACT BY IMPROPER DISPOSAL OF CONSTRUCTION WASTE AND DEMOLITION IN THE VALLEY OF MEXICO AND PROPOSED SETTLEMENT

ANÁLISIS DE IMPACTO AMBIENTAL POR LA INADECUADA DISPOSICIÓN DE RESIDUOS DE LA CONSTRUCCIÓN Y DEMOLICIÓN EN EL VALLE DE MÉXICO Y PROPUESTAS DE SOLUCIÓN

Rivera Mera Claudia Josefina
Gutiérrez Palacios Constantino

En la actualidad, uno de los mayores problemas ambientales que enfrenta la Ciudad de México es la cantidad de residuos sólidos generados por su población. De estos destacan los Residuos de la Construcción y Demolición (RC&D), los cuales hasta el momento carecen de una gestión adecuada que promueva su reuso o reciclaje y cuya generación asciende a las 3,000 ton/día1. La creciente demanda de vivienda, las necesidades de infraestructura y la falta de gestión ambiental, son factores determinantes en la disposición inadecuada de los RC&D, lo que provoca impactos al ambiente. En julio de 2006 entró en vigor la norma ambiental NADF-007-RNAT-2004, que tiene como objetivo establecer la clasificación y especificaciones de manejo de los residuos de la construcción en el Distrito Federal. Dicha norma establece la sustitución de por lo menos un 25% de materiales vírgenes por materiales reciclados en la construcción de diferentes obras, salvo que se compruebe mediante estudios un porcentaje diferente; con lo cual la norma pretende contribuir al aprovechamiento de los RC&D y reducción de los problemas ambientales derivados de su inadecuada disposición. Dado que actualmente no existen estudios que determinen los impactos ambientales producidos por la inadecuada disposición de los RC&D o que estudien su aplicación como agregados reciclados, y con el fin de contribuir a la aplicación de la Norma, el objetivo del presente trabajo es buscar alternativas de solución a los problemas ambientales derivados de la disposición inadecuada de los RC&D utilizando específicamente el reciclaje y recomendando su uso como agregados en obras de ingeniería en la que se satisfagan los requerimientos técnicos.

HOME COMPOSTING AS AS A MEANS OF MINIMIZING WASTE AND SOCIAL MOBILIZATION: CASE IN VILA SANTO ANTONIO, CAMPOS DE JORDÃO, SP, BRASIL

COMPOSTAGEM CASEIRA COMO INSTRUMENTO DE MINIMIZAÇÃO DE RESÍDUOS E DE MOBILIZAÇÃO SOCIAL: EXPERIÊNCIA NA VILA SANTO ANTONIO, CAMPOS DO JORDÃO, SP, BRASIL.

Silvia Roberta Lamanna
Wanda Maria Risso Günther

Domestic composting is an alternative for the correct destination of domestic wastes, practiced by their generators by means of simple techniques, whenever there is vailability of land and possibility of using the compost. It can be employed as an alternative to minimize the collecting and disposal problems in communities not served by a municipal collecting system and in situations of social and environmental risks. This paper assesses the implementation of domestic composting plants in the community of Vila Santo Antonio, located in the municipality of Campos do Jordão, State of São Paulo, Brazil, together with an Environmental Education Program – EEP

that encouraged, motivated and informed the local community. A gravimetric analysis was conducted for quantitative evaluation of the wastes from the collecting sector studied, before and after the application of the EEP. Domestic composting plants were implemented, monitored and evaluated on a monthly basis during a 12- month period. At the end of the period of study there was a reduction of 380 kg (55%) in the average of solid wastes generated daily and a reduction of 282 kg (83%) of the organic fraction in relation to the initial analysis. The conclusion is that domestic composting can be successful as a practice to be encouraged by the municipalities as an instrument to minimize domestic wastes and promote social mobilization. The results are even better if domestic composting is implemented together with an Environmental Education Program, designed according to the local reality.

GENERATION OF ENERGY FROM THE BIOGAS GENERATED IN LANDFILLS IN BRAZIL: POTENTIAL, LEGAL FRAMEWORKS, INCENTIVES AND PROJECTS

GERAÇÃO DE ENERGIA A PARTIR DE BIOGÁS DE ATERROS SANITÁRIOS NO BRASIL: POTENCIAL, MARCOS LEGAIS, INCENTIVOS E PROJETOS

MSc. Angela Cassia Rodrigues
Prof. Dr. Gilberto Martins

The generation of domestic solid wastes in Brazil was estimated at approximately 128,000 tons/day in 2000, of which 60% was made up of organic matter. The anaerobic decomposition of this fraction generates biogas, whose energy recovery is entitled to receive “Carbon Credits” through the Clean Development Mechanism (CDM), under the Kyoto Protocol. Estimates of the potential of power generation from sanitary landfill biogas vary from 440 to1480 MW. This article discusses the effectiveness of incentive policies and instruments to generate power from this source through bibliographic and documental research. Research of documents on the Ministry of Science and Technology website verified that out of a total of 161 projects approved by the Brazilian Designated National Agency (DNA), 22 of which are related to sanitary landfills, and only eight of them include energy generation in their scope, but one of them dismisses this possibility due to the low return on the investment. The remaining projects include only the collection of biogas or its improvement through controlled combustion. The research identified some recent laws and public funds that encourage biogas generation from biomass, either in isolated systems or in systems interconnected to the national electric grid. It was noticed, however, that they are not effective for this energy source. An effective instrument is the CDM, but it has been mostly used for methane combustion rather than the energy use because it is not economically attractive due to the additional investment for power generation. The research concludes that there is a

need for incentive policies focused on the energy use of USW, financing of research, pilot projects and nationalization of equipment. These policies should determine the obligation of purchasing and establish different prices for this renewable energy, taking into consideration the environmental and social benefits involved.