

REVISTA AIDIS



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

<http://www.journals.unam.mx/index.php/aidis/index>

Vol. 4, No. 2
2 de Diciembre de 2011

ISSN 0718-378X



FOTO
Acervo II-UNAM

Tabla de Contenido

Vol. 4, No 2.

- 1.- **TRATAMENTO DE ÁGUA DE LAVAGEM DE CANA DE AÇÚCAR POR COAGULAÇÃO, FLOCULAÇÃO E SEDIMENTAÇÃO** 1 - 13
TREATMENT OF WATER WASHING OF SUGAR CANE BY COAGULATION, FLOCCULATION AND SEDIMENTATION

Cristina Filomêna Pereira Rosa Paschoalato*, Nilton Martins Rodrigues Júnior, Bruno Moreira da Silva, Lorraine Bernardes Borges, Thais de Paula Silveira Mello, Carmen Sílvia Gonçalves Lopes.

- 2.- **ELIMINACIÓN DE COMPUESTOS VOLÁTILES OLOSOS POR ELECTROCOAGULACIÓN** 14 - 22
ELECTROCOAGULATION FOR THE ELIMINATION OF VOLATILE ODORS COMPOUNDS

Djalma Mariz Medeiros*, Aurelio Hernández Muñoz, Aurelio Hernández Lehmann, Manoel Lucas Filho.

- 3.- **MANEJO DE RESIDUOS GENERADOS DIRECTA O INDIRECTAMENTE POR EL CULTIVO DE CEBOLLA EN AQUITANIA (BOYACA-COLOMBIA)** 23 - 34
WASTE MANAGEMENT GENERATED DIRECTLY OR INDIRECTLY BY ONION CROP IN AQUITANIA (BOYACA-COLOMBIA)

Patricia Martínez-Nieto*, Daniel García-González, Paula Sofía Silva-Bonilla, Gustavo Vargas-Chaparro, Felipe Valderrama-Escallón.

- 4.- **CARACTERÍSTICAS QUÍMICAS DE LODOS DE ESGOTOS PRODUZIDOS NO BRASIL** 35 - 47
CHEMICAL CHARACTERISTICS OF SEWAGE SLUDGE PRODUCED IN BRAZIL

Marcelo Mendes Pedroza*, Gláucia Eliza Gama Vieira, João Fernandes de Sousa.

- 5.- **INATIVAÇÃO DE INDICADORES MICROBIOLÓGICOS COM OZÔNIO NO TRATAMENTO DE ESGOTO SANITÁRIO VISANDO O REUSO DE ÁGUA** 48 - 56
INACTIVATION OF MICROBIOLOGICAL INDICATORS WITH OZONE TO WASTEWATER TREATMENT AIMING WATER REUSE

Patrícia Bilotta*, Luiz Antonio Daniel.

- 6.- **ESTABILIZAÇÃO DE FEZES HUMANAS ATRAVÉS DE COMPOSTAGEM EM REGIME DE BATELADA** 57 - 67
STABILIZATION OF HUMAN FECES BY COMPOSTING SCHEME IN BATCH

Thais Cardinali Rebouças, Karla Santos Limoeiro, Gabriel Hector Fontana, Caio Cardinali Rebouças, Ricardo Franci Gonçalves.*



- 7.- **ANÁLISE DE ASPECTOS AMBIENTAIS DA TECNOLOGIA DE EVAPORAÇÃO APLICADA AO TRATAMENTO DE LIXIVIADO DE ATERRO SANITÁRIO** **68 - 79**
ENVIRONMENTAL ANALYSIS OF THE EVAPORATION TECHNOLOGY APPLIED TO TREATMENT OF LEACHATE LANDFILL

Débora Machado de Oliveira*, Haical Sajovic Haddad, Armando Borges de Castilhos Jr.

REVISTA AIDIS

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

TRATAMENTO DE ÁGUA DE LAVAGEM DE CANA DE AÇÚCAR POR COAGULAÇÃO, FLOCULAÇÃO E SEDIMENTAÇÃO

*Cristina Filomêna Pereira Rosa Paschoalato¹
Nilton Martins Rodrigues Júnior¹
Bruno Moreira da Silva¹
Lorraine Bernardes Borges¹
Thais de Paula Silveira Mello¹
Carmen Sílvia Gonçalves Lopes¹

TREATMENT OF WATER WASHING OF SUGAR CANE BY
COAGULATION, FLOCCULATION AND SEDIMENTATION

Abstract

The manufacturing of sugar and alcohol consume and generate significant volumes of wastewater, being the largest share to the washing of sugar cane, which aims to withdraw earthenware and straw that accumulate along the cane during the harvest. The water wash of sugar cane (WWSC) is usually recirculated and over time loses quality, requiring large volumes of replacement. Currently, the treatments applied to the WWSC to recycle is the correction of pH and natural sedimentation, without the aid of chemical coagulants, which has low efficiency and high retention time, thus the process of chemically assisted primary sedimentation (CAPS) can be an alternative for the treatment of the WWSC in recycle. The aim of this study was to promote improvement in the quality of the WWSC in a production unit of sugar and alcohol. A sample of WWSC was collected at the plant and transported to the laboratory where tests were performed in static reactors (jar-test) with commercial coagulants, ferric chloride and ferrous sulfate chloride (floculan) for the optimization of the stages of coagulation, flocculation and sedimentation. During the period of the survey was carried out monitoring of WWSC in operation of the plant with the objective of characterization and evaluation of the efficiency of the system in full scale operation. A mass balance was used to estimate the amount of generated sludge. The results of treatment of WWSC showed that the coagulant floculan was presented the best efficiency in removing turbidity and total suspended solids with 99% and 97% respectively. The suppression of the flocculation step did not change in removal efficiency of turbidity and suspended solids. Not using flocculation resulted in increased turbidity values. The economic study for different alternatives of treatment application showed the application feasibility of coagulant intermittently. Considering the system in full scale operation, it could be predicted a reduction in costs with the use of coagulant and sludge production rates due to the effect of the gradual increase in the quality of the WWSC.

Key Words: primary sedimentation; recycle; sugar cane; water washing of cane.

¹ Universidade de Ribeirão Preto (UNAERP)

*Corresponding author: Rua Argeu Fuliotto 419 Ribeirânia Ribeirão Preto -SPCEP: 14096-520, Brasil. Email: cpaschoa@unaerp.br

REVISTA AIDIS

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

ELIMINACIÓN DE COMPUESTOS VOLÁTILES OLOROSOS POR ELECTROCOAGULACIÓN

*Djalma Mariz Medeiros¹
Aurelio Hernández Muñoz¹
Aurelio Hernández Lehmann¹
Manoel Lucas Filho²

*ELECTROCOAGULATION FOR THE ELIMINATION
OF VOLATILE ODORS COMPOUNDS*

Abstract

The emission of odors in wastewater treatment plants represents a significant impact. Increased awareness of population about their rights and increased numbers of treatment plants in operation, associated with urban pressures on vacant areas that force the construction of residences and / or entertainment complexes increasingly coming from sewage treatment plants, force companies responsible for the sewage to consider this problem, seeking solutions consistently to avoid conflicts with communities. The use of electrochemical processes for wastewater treatment is becoming increasingly important because of its versatility, small size and capability of automation. In this sense, are of special interest electrocoagulation as a method of treatment of odorous compounds present in wastewater. During this investigation we have studied the removal of odorous volatile compounds (carbon disulfide, toluene and dichloromethane) by electrocoagulation process.

We have investigated the effect of reactor design (configuration 1 power, 2 powers consecutives and configuration of 2 powers separated), the nature of the electrodes (aluminum), and electric current (0.5 A, 2 A, 4 A 6 A, 8 A and 9.5 A).

Satisfactory yields were observed for carbon disulfide and determined optimal performance by aluminum electrodes 2.5 cm apart., Using the one source, and applying extremely low electric current (0.5 amps). Referring to toluene was a slight performance, while there was no meaningful action on the dichloromethane. The configuration of a source, as well as having presented the best yields for carbon disulfide and toluene, require lower power and lower retention time.

Key Words: volatile compounds, electrocoagulation, odor, wastewater treatment plants.

¹ Departamento de Ingeniería Civil, Universidad Politécnica de Madrid.

² Departamento de Ingeniería Civil, Universidade Federal do Rio Grande do Norte.

* Corresponding author: Calle Felipe Cortez, 1481, piso 202, Lagoa Nova - Natal - Rio Grande do Norte. Código Postal: 59056150. Brasil. Email: djalmamedeiros@hotmail.com

REVISTA AIDIS

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

MANEJO DE RESIDUOS GENERADOS DIRECTA O INDIRECTAMENTE POR EL CULTIVO DE CEBOLLA EN AQUITANIA (BOYACA-COLOMBIA)

*Patricia Martínez-Nieto¹
Daniel García-González²
Paula Sofía Silva-Bonilla²
Gustavo Vargas-Chaparro³
Felipe Valderrama-Escallón¹

WASTE MANAGEMENT GENERATED DIRECTLY OR INDIRECTLY BY
ONION CROP IN AQUITANIA (BOYACA-COLOMBIA)

Abstract

The crop of green onion (*Allium fistulosum* L.) in Aquitania, municipality belonging to Basin of Tota Lake in Colombia, used high amounts of chicken manure to fertilize and chemical synthesis inputs for pest and disease. This has led to pollution and eutrophication of the Tota Lake, which encouraging the proliferation of aquatic macrophytes as Brazilian elodea (*Egeria densa* Planch). Elodea mechanically extracted from TOTA Lake, wastes from the process of leaf removal and deburring onion, known as “pelanza”, and chicken manure, can be converted into high-quality compost using beneficial microorganisms in the composting process. Six treatments with two replicates that consisted of two mixes of waste, with and without addition of microbial inoculants, were designed for this research. The macronutrient content was increased in the mixture with chicken, onion waste, elodea, barley flour and rice hulls, mainly when it was inoculated with cellulolytic, proteolytic and amylolytic microorganisms. None of the treatments presented heavy metals, pathogenic human or phytopathogenic nematodes. In phytotoxicity bioassay in radish (*Raphanus sativus* L.), the highest germination rate was obtained with treatment using onion, elodea and rice hulls inoculated cellulolytic, proteolytic and amylolytic microorganisms. Biofertilizer production due to their biological and nutritional characteristics is a good alternative to the onion crop waste management in subpáramo; within the concept of sustainable development.

Keywords: Composting, Brazilian elodea, chicken manure, degrading microorganisms of matter organic, onion waste.

¹ Fundación Humedales

² Corporación para el desarrollo participativo y sostenible de pequeños agricultores (Corporación PBA)

³ Productores asociados de cebolla larga y otras hortalizas en producción más limpia del Municipio Aquitania (Asociación Parcela)

* Corresponding author: Calle 142 No 13-49 Interior 2. Conjunto Residencial “El Pórtico”. Barrio Cedritos-Bogotá-Colombia.
Email: patingli@gmail.com

REVISTA AIDIS

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

CARACTERÍSTICAS QUÍMICAS DE LODOS DE ESGOTOS PRODUZIDOS NO BRASIL

*Marcelo Mendes Pedroza¹
Gláucia Eliza Gama Vieira²
João Fernandes de Sousa¹

CHEMICAL CHARACTERISTICS OF SEWAGE SLUDGE PRODUCED
IN BRAZIL

Abstract

This study aimed to determine the chemical characteristics of domestic sludge produced in Brazil. The samples were collected in beds of dry sewage treatment plant. The waste sludge LD-1 and LD-10 were typically anaerobic sludge sample and LD-6 was a mixed sludge, rich in ferric chloride. LD-1 and LD-6 showed a moisture content of 12.0 and 11.5%, respectively. The highest ash content was observed in the sample LD-six (46.2%). The lower concentration of organic matter was detected in LD-6 (40.6%), because it is rich in ferric chloride sludge. LD-10 had the highest carbon content (27.0%). The main metals found in sludge sample LD-1 were iron, zinc, manganese, lead, copper, nickel and chromium. The total iron showed the highest concentration (28,911 mg/kg). Nickel has the lowest of them (24 mg/kg). All metals determined in the sludge LD-1 had concentrations below the limits set for agricultural use by the Brazilian resolution. The main functional groups detected in the sludge, through FTIR, were alcohol, carboxylic acid, amides, amines, phenols, hydrocarbons and silicates. The sludge appear in their chemical composition, various substances such as nucleic acids, proteins, carbohydrates, lipids, humic substances and cellulose. These compounds have a very high potential energy to be treated as mere waste. This potential can be transformed from waste to raw material, in thermal processes of incineration and pyrolysis.

Key Words: chemical analysis, functional groups, heavy metals, minerals, sewage sludge.

¹ Universidade Federal do Rio Grande do Norte (UFRN)

² Universidade Federal do Tocantins (UFT)

*Corresponding autor: Rua Aristides Porpino Filho, número 3121, Ponta Negra, Natal, Rio Grande do Norte, 59090-720, Brasil.
Email: mendes@ifto.edu.br

REVISTA AIDIS

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

INATIVAÇÃO DE INDICADORES MICROBIOLÓGICOS COM OZÔNIO NO TRATAMENTO DE ESGOTO SANITÁRIO VISANDO O REUSO DE ÁGUA

*Patrícia Bilotta¹
Luiz Antonio Daniel¹

*INACTIVATION OF MICROBIOLOGICAL INDICATORS WITH OZONE
TO WASTEWATER TREATMENT AIMING WATER REUSE*

Abstract

This study intends to demonstrate the technical potentiality of the wastewater pre-disinfection (primary treatment effluent) to optimize the indicator pathogen inactivation. The essays were developed with Wastewater Treatment Plant effluent to simulate the method on real conditions, in two stages of disinfection with ozone. Microbiological exams revealed inactivation superior to 1 log to the three species evaluated (*Escherichia coli*, coliphages and *Clostridium perfringens*) only introducing 1.0 mgO₃/L in the pre-disinfection. Considering the inicial low dosage of germicide agent, the results prove the technical viability promising of the methodology proposed to reach the emission microbiological standards established by the Brazilian regulation and to provide ways to final effluent adequacy in agreement with the guidelines defined by WHO to its reuse in the unrestricted irrigation.

Key-words: Disinfection, wastewater, ozone, indicator pathogen.

¹ Departamento de Gestão Ambiental, Faculdade Evangélica do Paraná

² Departamento de Hidráulica e Saneamento, Universidade de São Paulo

* *Corresponding author:* Rua Carlos Cavalcanti, 289, Centro, Curitiba, Cep. 80020-280, Paraná, Brasil.
Email: pb.bilotta@gmail.com

REVISTA AIDIS

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

ESTABILIZAÇÃO DE FEZES HUMANAS ATRAVÉS DE COMPOSTAGEM EM REGIME DE BATELADA

*Thais Cardinali Rebouças¹
Karla Santos Limoeiro¹
Gabriel Hector Fontana¹
Caio Cardinali Rebouças¹
*Ricardo Franci Gonçalves¹

STABILIZATION OF HUMAN FECES BY COMPOSTING
SCHEME IN BATCH

Abstract

The Ecological Sanitation (Ecosan) refers to the residuary waters management system focusing in a principle of recycle the water and the nutrients back to their generating source. Segregate faeces and urine, avoiding their mixture, is one of the Ecosan's basics markings. The human faeces obtained after the segregation have valuable qualities for soil improvement, however the main abstraction in this nutrients recycling is the association with enteric pathogens. The composting is the most common treatment to reach a disinfection of the faeces when the goal is its application as soil conditioner. In this sense, the objectives were characterize the excreta under a physico-chemical and biological's view; study the optimum conditions of composting human faeces with carbonaceous addition from sawdust and confirm the quality of the final compost to application on soil. The used methodology was separated in two stages: I. faeces quali-quantitative characterization and II. human faeces composting by application of three sawdust's proportions. The obtained result was the temperature over than 50°C and a reduction of *Escherichia coli* to not detectable levels.

Key Words: *Ecological Sanitation; Human Faeces; Composting; Reuse.*

¹Departamento de Engenharia Ambiental, Universidade Federal do Espírito Santo (UFES)

* *Corresponding author:* Av. Fernando Ferrari, S/N Goiabeiras - Vitória – ES, CEP: 29060-970 – Brasil. Email: franci@npd.ufes.br, thaiscardinali@gmail.com



REVISTA AIDIS

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

ANÁLISE DE ASPECTOS AMBIENTAIS DA TECNOLOGIA DE EVAPORAÇÃO APLICADA AO TRATAMENTO DE LIXIVIADO DE ATERRO SANITÁRIO

*Débora Machado de Oliveira¹
Haical Sajovic Haddad²
Armando Borges de Castilhos Jr.²

*ENVIRONMENTAL ANALYSIS OF THE EVAPORATION
TECHNOLOGY APPLIED TO TREATMENT OF LEACHATE LANDFILL*

Abstract

This study aimed to investigate the possible environmental impacts associated with the evaporation technology of landfill leachate. For this reason, experiments were performed at the laboratory scale in order to evaluate the quality of effluent resulted from the process. The experiment was conducted in two stages. The objective of the first stage was to diagnose the behavior of some pollutants into the process of evaporation/distillation. The results of this stage indicated that the process was effective with respect to the removal of COD, TOC, Cl⁻, and TS. By contrast, higher concentrations of NH₃ (4,125 mg.L⁻¹) were transferred to the condensate. From this standpoint, a second stage was conducted in order to evaluate the potential of NH₃ and H₂S emissions of the gases evaporated from the process of evaporation. The results from this stage showed high concentrations of NH₃ in the gas, reaching concentrations close to 1,555 mg.m⁻³. The presence of H₂S, on the other hand, was not detected in the gases.

Key Words: leachate, evaporation/distillation, environmental impacts

¹ Departamento de Engenharia Ambiental e Energias Renováveis, Universidade Federal da Fronteira Sul

² Departamento de Engenharia Sanitária e Ambiental, Universidade Federal de Santa Catarina

*Corresponding autor: Universidade Federal da Fronteira Sul - Campus Cerro Largo. Departamento de Engenharia Ambiental e Energias Renováveis. Rua João Sebastiany, 16 - CEP 97900-000. Cerro Largo, Rio Grande do Sul, Brasil.
Email: debora.machado@uffs.edu.br