THE JOURNAL OF SOLID WASTE TECHNOLOGY AND MANAGEMENT

A ISWMAW Publication

Publishing from 2009

Formerly The Journal of Resource Management and Technology (Volumes 02-23)
Formerly NCRR Bulletin (Volumes 1-11)

March 2023 **Volume 49** **Number 1**

ISWMAW International Society of Waste Management, Air and Water

Widener University

THE JOURNAL OF SOLID WASTE TECHNOLOGY AND MANAGEMENT

A ISWMAW Publication

Journal doi: http://doi.org/10.5276/jswtm/iswmaw
Issue doi: http://doi.org/10.5276/jswtm/iswmaw/491

Publishing from 2009
Formerly The Journal of Resource Management and Technology (Volumes 02-23) Formerly NCRR Bulletin (Volumes 1-11)

March 2023 **Volume 49** **Number 1**

THE JOURNAL OF SOLID WASTE TECHNOLOGY AND MANAGEMENT

ISSN: 1088-1697

ABSTRACTED/INDEXED IN: CAS database (Chemical Abstracts), Engineering Abstracts (Compendex), Environmental Abstracts, Environmental Periodicals Bibliography, Pollution Abstracts, All-Russian Institute of Scientific and Technical Information (VINITI, REFERATIVNYI ZHURNAL), SCOPUS, Google scholar, EBSCO, SCImago, GreenFILE

The Journal of Solid Waste Technology and Management, is published by International Society of Waste Management, Air and Water (ISWMAW) in collaboration with Widener University, School of Engineering. The responsibility for contents rests solely upon the authors. This journal is available by subscription and may be purchased at the rates posted at ingentaconnect.com/content/jswt/jswt and at www.iswmaw.com. Editorial and subscription address is: Sustainable Development & Circular Economy Research Centre, ISWMAW, 29/6, Jadunath Ukil Road, Kolkata - 700041, India. Email: journalswtm@gmail.com. Web site: www.iswmaw.com and www.solid-waste.org.

THE JOURNAL OF SOLID WASTE TECHNOLOGY AND MANAGEMENT

A ISWMAW Publication

ISSN: 1088-1697

Publishing from 2009
Formerly The Journal of Resource Management and Technology (Volumes 02-23) Formerly NCRR Bulletin (Volumes 1-11)

March 2023 **Volume 49** **Number 1**

Editorial:

Focus on carbon emission and extraction of natural resources Reduction

In many countries the initiative of enhancing the efficacy of the waste management system has been observed recently which may be reflected during the data mining and its analysis at the end of this decade. Trend of adaptation of new legislation, new technologies and using social media as a platform for generating mass awareness have been witnessed in many countries in recent past. These initiatives are taken in tandem with the implementation of strategies and targets based on 3Rs (Reduce, Reuse and Recycle) and Circular Economy addressing the Sustainable Development Goals. The waste management projects must address the entire lifecycle of waste—from generation to final disposal via collection, transportation, and treatment processes leading to a robust business model. A few aspects, namely, infrastructure, legal structures and institutions, financial sustainability, citizen engagement, social inclusion, climate change and the environment, health and safety, knowledge creation, employment generation, recirculation of resources and economic development have to be considered in any waste management Project.

Significant paradigm shift from epcd2 (extract-produce-consume-dispose-deplete) concept to the regenerative circular economy concepts took place to achieve zero defects by resource conservation through changed concept of design of production processes and materials selection for higher life cycle, conservation of all kinds of resources, material and/or energy recovery all through the processes, and at the end of the life cycle for a specific intended use of the product will be still fit to be utilised as the input materials to a new production process in the value chain with a close loop materials cycles. This improves resource efficiency, resource productivity, benefit businesses and the society, creates employment opportunities and provides environmental sustainability. Research needs to be more focused on the innovation to adopt technologies, materials, management systems that will absorb more circularity of resource utilisation with a significant reduction of carbon emission, significant reduction of extraction of natural resources and environmental sustainability.

Prof. Dr. Sadhan Kumar Ghosh
Editor-in-Chief,
Journal of Solid Waste Technology and Management (JSWTM)

IMPORTANCE OF SOLID WASTE ASSESSMENT AND QUANTIFICATION: NEW JERSEY COUNTIES CASE STUDY

Serpil Guran[1,*], Stacey Demers[2], Josh DeGayner[2], David Specca[1], Victoria Phillips[3], Coryanne Mansell[3], Christine Symington[4]

[1]The EcoComplex, Rutgers, the State University of New Jersey; USA
[2]SCS Engineers, USA
[3]Center for Eco Technology, USA
[4]Sustainable Princeton, USA

Received on: December 26, 2022

Accepted on: February 20, 2023

ABSTRACT

The State of New Jersey (The State) established yearly waste reduction and recycling goals that target recycling 50% of the Municipal Solid Waste (MSW) Type 10 (ID# 10) waste and 60% of the entire waste stream. In order to assist the State with meeting the waste reduction and recycling goals, the project team performed a yearlong waste stream composition study, including physical inspection and assessment of the individual constituents, to create reliable, up-to-date ID #10 MSW data by a percentage of total MSW weight. Identifying the source of the waste stream as rural (population density less than 500 people/sq. mile), suburban (population density between 500 to 1999 people/sq. mile), urban (population density is 2000 or more people /sq. mile) is critical for understanding the waste generation trends of these residential areas. Study revealed that food waste, plastic waste and compostable paper are the highest weight percentage components of residential and commercial ID#10 MSW. The study is a comprehensive analysis which can serve as an efficient decision-making tool.

Keywords: Solid waste, solid waste disposal, food waste, recycling.

* *Corresponding author: Serpil Guran, email: sg795@njaes.rutgers.edu, The EcoComplex, Rutgers, the State University of New Jersey; USA*

REMEDIATION PROCESS IN LANDFILL IN ARCTIC REGION - A CASE OF CIRCULAR ECONOMY

Sadhan Kumar Ghosh[1,*], Tatiana S. Smirnova[2,3], Vladimir A. Maryev[4], Dineshkumar M[5]

[1]Sustainable Department & Circular Economy Research Centre, ISWMAW, Kolkata,
[2]Federal State Autonomous Body Research Institute "Environmental Industrial Policy Centre", Moscow region, Russian Federation
[3]Gubkin Russian State University of Oil and Gas (National Research University), Moscow region, Russian Federation
[4]Mendeleev University of Chemical Technology of Russia, Moscow region, Russian Federation
[5]Department of Mechanical Engineering, Jadavpur University, India

Received on: November 18, 2022

Accepted on: February 20, 2023

ABSTRACT

The Arctic region is a vast and inhospitable environment that presents significant challenges for waste management. Spanning 27 million Sq.km and shared by eight nations, the region has limited infrastructure and only 11% of waste has been treated properly. The high cost of waste removal in the Arctic, due to logistical and technological constraints, makes the challenge of safe waste management even greater insisting on the need for elaborate research in extracting such resources. Concerning those, this study was conducted to fill this gap by investigating the feasibility of extracting secondary resources from two specific sites: an MSW landfill in Dudinka, Russia and an industrial waste deposition site located in the permafrost zone in the Krasnoyarsk region. The research will evaluate the environmental and ecosystem impacts of these landfills and examine various technical and economic approaches for reclaiming resources from them. The findings of this study will provide valuable insights into the viability of extracting secondary resources from waste in the Arctic and inform future waste management strategies in the region. By applying the principles of the circular economy, that identifies that the best approach for addressing the waste management problem in Dudinka is the creation of an eco-industrial park for deep processing and manufacturing of products from secondary resources reducing the environmental impact of waste disposal and promote sustainable resource utilization in the permafrost regions.

Keywords: Arctic waste management, circular economy, resource recovery, landfill remediation, logistics, environmental impact.

* *Corresponding author: Sadhan Kumar Ghosh, email: sadhankghosh9@gmail.com, ISWMAW, Kolkata, India*

DECOLORIZATION OF ACID DYE USING LOW-COST ORGANIC ADSORBENTS

Sowmyalakshmi. K. B, Munilakshmi. N*

Department of Civil Engineering, S.V.U.C. E, S.V. University, Tirupati, Andhra Pradesh, India

Received on: October 15, 2022

Accepted on: February 25, 2023

ABSTRACT

Dyes are extensively used in industries. Dye color in water courses reduces photosynthetic activity which further affects the aquatic life. It also causes skin cancer and allergies to human beings. It's imperative to remove dye color from an aqueous dye solution. The objective of the present study is to find the efficiency of low-cost organic adsorbents in the decolorization of Color Index Acid blue 45 dye from an aqueous solution. The organic adsorbents used in the present study are Gigantea Leaves (GL), Curcuma Longa Leaves (CLL), Moringa Oleifera (MO) and Citrus Sinensis (CS). The study consists of non-agitated flow experiments at optimum pH with varying dosages and contact time. The results showed that excellent color removal of dye can be achieved with adsorbents at optimum pH of 4 with Gigantea Leaves of 85%, good color removal of 78% and 76% with Curcuma Longa Leaves and Moringa Oleifera, and, moderate color removal of 53% with Citrus Sinensis. The isothermal equilibrium sorption data was well fitted into the Freundlich Isotherm. Kinetic studies states that chemisorption is the rate limiting step. Gigantea leaves, Curcuma Longa and Moringa Oleifera show great promise in decolorizing aqueous solution of C.I. Acid Blue 45.

Keywords: Adsorption, Acid blue 45, Curcuma Longa Leaves, Citrus Sinensis, Gigantea Leaves, Moringa Oleifera.

* *Corresponding author: Munilakshmi. N, email: nml.svuce@gmail.com, Department of Civil Engineering, S.V.U.C. E, S.V. University, Tirupati, AP, India*

INFLUENCING FACTORS ON WASTE SORTING BEHAVIOUR AT SORAN UNIVERSITY IN KURDISTAN, IRAQ

Khadijeh Mirza[1,*], Shireen Mansour Awad Al-majmaie[2]

[1]Chemical Engineering Department, Faculty of Engineering, Soran University, Soran, Iraq
[2]Petroleum Engineering Department, Faculty of Engineering, Soran University, Soran, Iraq

Received on: January 03, 2023

Accepted on: March 20, 2023

ABSTRACT

In this work, the effect of age, gender, monthly income, and education level on the waste sorting behavior (WSB) of 163 employees and students at the Soran University of Kurdistan in Iraq was investigated. Also, respondents' opinions were collected regarding government policies for waste sorting (WS) and increasing people's awareness. The results showed that WSB improves with age. Also, women categorize garbage more than men. No significant correlation was observed between monthly income and education level with WSB. Although 77% of the respondents are willing to participate in WS activities, only 28% of them sort their waste. They consider the main reason for not separating waste to be the lack of special facilities for WS and recycling in most areas of Kurdistan, and few people consider WS tiring and time-consuming. 75% of the respondents believe that the government's efforts to increase the environmental awareness of citizens are insufficient. This result is consistent with the fact that WS is an unconventional behaviour in Kurdistan.

Keywords: Waste sorting behaviour, Waste management, Soran university, Influencing factors, Environmental awareness.

* *Corresponding author: Khadijeh Mirza, email: khadijeh.mirza@cheme.soran.edu.iq, Chemical Engineering Department, Soran University, Soran, Iraq*

INFORMAL E-WASTE RECYCLING AND RELATED CHALLENGES: EVIDENCE FROM AN EXPLORATORY SURVEY IN JOS, PLATEAU STATE, NIGERIA

Isaac Tebogo Rampedi[1,*], Kangyang Josiah Miner[2], Ayodeji Peter Ifegbesan[2]

[1, 2]Department of Geography, Environmental Management & Energy Studies, South Africa
[2]Department of Arts and Social Sciences, Olabisi Onabanjo University, Nigeria

Received on: November 15, 2022

Accepted on: February 20, 2023

ABSTRACT

The informal electronic waste recycling sector is a major contributor to livelihoods for a large population of unemployed people in developing countries. However, informal e-waste collectors operate under precarious environments which expose them to health risks which may have lasting impacts on their wellbeing. This survey has analysed e-waste collection, levels of awareness and operational challenges amongst informal e-waste workers in Jos (Nigeria). The study made use of questionnaire-administered interviews and 103 respondents participated in the survey. Most respondents were predominantly men, and majority had high school and tertiary education. Reclaimed e-wastes included electric irons (59.6%) and cables (57.7%); DVDs (49%); as well as TV and radio sets (42.3%). Furthermore, respondents travelled longer distances to access various collection points and buyback centres where their recovered waste items are sold for income-generating purposes. However, respondents also mentioned several illnesses which afflict them, of which body pains (37%) and headaches (46%) were the most frequent. The survey found no statistically significant relationships between respondents in terms of their willingness to recycle e-wastes, participate in improved recycling activities, and the challenges experienced in their daily activities. To overcome some the operational challenges in the informal e-waste activities, a few recommendations have been mentioned.

Keywords: e-waste reclaiming, pollution, distances traversed, awareness levels, statistical relationships.

* *Corresponding author: Isaac Tebogo Rampedi, email: isaacr@uj.ac.za, Department of Geography, Env. Management & Energy Studies, South Africa*

PERFORMANCE OF DUAL-FUEL (DF) ENGINE POWERED WITH THE PRODUCER GAS DERIVED FROM SUGAR CANE BAGASSE AND DIESEL INJECTION

Hemanth Kumar K. J.[1,*], B. Sadashive Gowda[2], Jyothilakshmi R[3], N. R. Banapurmath[4]

[1,2]Department of Mechanical Engineering, Vidyavardhaka College of Engineering, Mysuru, India
[3]Department of Mechanical Engineering, M S Ramaiah Institute of Technology, Bangalore, India
[4]Department of Mechanical Engineering, KLE Technological University, BVB Campus, Hubballi, India

Received on: December 10, 2022

Accepted on: March 10, 2023

ABSTRACT

Renewable and sustainable fuel usage in diesel engines ensures energy security and overseas exchange savings besides conveying both socio-economic and environmental concerns. This research presents experimental work that has been done on single-cylinder, 4-stroke, diesel engine of direct injection run in DF mode using PG derived from sugar cane bagasse renewable and sustainable fuels. A 45° gas venture is designed and developed to provide a stoichiometric mixture of gas and air entry into the intake manifold of the DF engine during suction stroke. A compressed mixture of air and gas is ignited by injecting diesel into the engine cylinder at 205 bar pressure and at different timings of injection. The effect of timing of injection on the DF engine performance is studied by varying it from 23 to 31obtdc in steps of 4obtdc. Experimental investigation showed that 27oBTC resulted in improved BTE with reduced emissions of hydrocarbon, smoke, and CO while NOx, peak pressure increased. It is noticed that the operation of producer gas lowers the power de-rating by 20% and the DF engine could run up to 80% load with increased nitric oxide (NOx) emissions. The developed DF engine worked satisfactorily with acceptable performance and emission norms and assisted in partially substituting the fossil diesel fuel with a substitution of 60-70% by the PG operation.

Keywords: Sugar cane bagasse biomass, producer gas, combustion chamber shape, nozzle geometry, dual-fuel engine.

* *Corresponding author: Hemanth Kumar K.J., Department of Mechanical Engineering,Vidyavardhaka College of Engineering, Mysuru, Karnataka, India*

ANAEROBIC DIGESTION (AD) BASED WASTE MANAGEMENT IN NEPAL: TECHNOLOGIES AND IMPLEMENTATION MODALITIES

Mukesh Ghimire[1, 2,*], Jong Roul Woo[2], Sudeshana Pandey[2]

[1]Alternative Energy Promotion Center, Ministry of Energy, Water Resources and Irrigation, Government of Nepal, Kathmandu, Nepal
[2]Graduate School of Energy and Environment (KU-KIST Green School), Korea University, Seoul, South Korea

Received on: December 26, 2022

Accepted on: March 20, 2023

ABSTRACT

Developing countries are still facing severe challenges for providing access to clean energy, managing waste and struggling to meet Sustainable Development Goals (SDG) targets. Anaerobic Digestion (AD) based waste management technologies have great potential for addressing these challenges. Public Private Partnerships (PPP) are the key government's policy and strategic directions for promoting biogas as a multi-beneficiary's product and services in Nepal. Nepal's biogas promotion PPP model and technologies in domestic biogas sector have been replicated in many African and Asian countries. AD based Gobar Gas Company (GGC 2047 model) and Continuously Stirred Tank Reactor (CSTR) based technologies have been promoted for domestic and large applications respectively in wider scale. Comprehensive review and analysis using technological and implementation progress results through government interventions revealed that with the potential of 1.1 million of domestic biogas 433,173 systems have been installed. Quantification of outcomes of AD based technologies revealed that in addition to the energy access to more than 1.8 million people, these significantly contributed for production of gas amounting 456,282 m3 and substituted equivalent 15,578 nos. of LPG cylinders and 2229.91 tons of fertilizer daily. Under Carbon Development Mechanism (CDM), Total 21.20 million USD have been earned as carbon revenue from this sector, which has played significant role for earning revenue from carbon financing. Similarly, Developing Carbon Program for Large Scale Biogas through ITMO (Internationally Transferred Mitigation Outcomes: a new carbon mechanism) is under way. Overall, biogas sector is contributing for country's energy security and circular economy through replacement of fossil fuels and chemical fertilizers along with the waste management.

Keywords: Anaerobic Digestion, Waste Management, PPP, Nepal Biogas, Carbon Revenue.

* *Corresponding author: Mukesh Ghimire, Alternative Energy Promotion Center, Ministry of Energy, Water Resources and Irrigation, Government of Nepal, Kathmandu, Nepal, email: mukeshghimire.ku@gmail.com*