

Aerobic biological treatment of landfill leachate

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Abstract

There is an ongoing need to treat leachates from landfills using approaches that avoid expensive installation and operating costs. Faced with such a problem, Powys County Council (Wales, UK) developed a treatment system based on practical experience. Leachate was re-circulated through aeration towers containing a biofilm supported on plastic media before being polished in reed/filter beds.

Investigations were undertaken to evaluate the performance of these processes. Replicated model aeration towers (1/300 site scale) were used to establish treatment rates for pollutants in leachates of varying strengths; the effects of temperature and variations in pollutant concentrations were also evaluated. Data from these model experiments were corroborated with findings from pilot-scale plants (1/10 site scale) operating on landfill sites. Assessment of treatment performance was based on the degree of amelioration of standard chemical (ammoniacal-N and total organic carbon) parameters. A range of related parameters including nitrate, pH and redox potential were measured in support of these assessments.

Model system experiments indicated treatment rates at 15 °C (883-1895 mg NH₃-N m⁻³ h⁻¹; 347-1600 mg TOC m⁻³ h⁻¹) that were similar across a wide range of leachate concentrations (37-1880 mg l⁻¹ ammoniacal-N; 130-5315 mg l⁻¹ COD). Marked changes in the concentration of leachates did not affect treatment efficiency following a short lag effect. Process rates roughly halved with each 5°C decrease in temperature below 15°C, significant nitrification was maintained at temperatures of 0.5-1 °C. High variability in treatment capacity was observed for individual plastic media. Treatment rates in pilot scale plants were slightly higher but broadly consistent with those obtained in model systems.

Keywords: leachate treatment, aerobic, temperature, leachate strength, biofilm.



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F. A. Ortega Riegos, M. Lega, H. Itoh



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Sustainable Development (2 Volume Set) C.A. Brebbia, 2015-10-06 This collection of research papers presented at meetings organised by the Wessex Institute of Technology WIT concerns a variety of issues relating to the area of sustainable development WIT has a long and very successful record of organising conferences on the topic of sustainability which requires an interdisciplinary approach Any sustainable solutions that are derived solely from the perspective of a single discipline may have unintended damaging consequences that create new problems Thus effective sustainable solutions require the collaboration of scientists and engineers from various disciplines as well as planners architects environmentalists policy makers social scientists and economists The contents of this book reflect that interdisciplinary approach and include topics under the main areas of Sustainable development and planning Disaster management Air pollution Urban transport Ecosystems and Water resources management

Water Pollution XIV S. Hernández, S. Mambretti, 2018-08-21 Water pollution problems are of continued importance around the world with an impact on both populated areas and the environment This volume consists of papers presented at the 14th International Conference in the series of Monitoring Modelling and Management of Water Pollution The environmental problems caused by the increase of pollutant loads discharged into natural water bodies requires the formation of a framework for regulation and control This framework needs to be based on scientific results that relate pollutant discharge with changes in water quality The results of these studies allow industry to apply more efficient methods of controlling and treating waste loads and water authorities to enforce appropriate regulations regarding this matter Environmental problems are essentially interdisciplinary Engineers and scientists working in this field must be familiar with a wide range of issues including the physical processes of mixing and dilution chemical and biological processes mathematical modelling data acquisition and measurement to name but a few In view of the scarcity of available data it is important that experiences are shared on an international basis Thus a continuous exchange of information between scientists from different countries is essential Topics covered include Water contamination Monitoring modelling and forecasting Water management Wastewater management Groundwater and aquifers Flood damage Freshwater quality Coastal and offshore pollution Health risk studies Agricultural contamination Industrial pollution Water reuse Emerging technologies Socio economic political consequences Population and climate change Education and training

Water Resources Management IX C.A. Brebbia, Z. Boukalova, 2017-10-11 Containing papers from the ninth International Conference on Sustainable Water Resources Management this book presents the work of scientists practitioners and other experts regarding recent technological and scientific developments associated with the management of surface and sub surface water resources Water is essential for sustaining life on our planet nevertheless its unequal distribution is a source of permanent conflict It is predicted that population growth and irregular rainfall due to climate change may lead to more restricted access to water in certain regions of the world This problem is made even more severe by human actions that can

cause degradation to nature and the environment These papers cover such topics as Water management and planning Water rights and accessibility Water markets economics and policies Climate change Sedimental soil erosion Irrigation Water resources in arid regions Ground water Urban water management Hydraulic engineering Trans boundary water management Water food and energy Socio economic aspects Innovative technologies Water and the community Integrated water analysis Wetlands as water sources

Waste Management and the Environment IX F. A. Ortega Riegos, M. Lega, H.

Itoh, 2019-01-30 Containing the proceedings from the 9th International Conference on Waste Management and the Environment this book is a collection of research on current waste disposal methods as well as highlighting better practices and safer solutions for the future Waste Management is one of the key problems of modern society due to the ever expanding volume and complexity of discarded domestic and industrial waste Society is increasingly aware of the need to establish better practices and safer solutions for waste disposal This requires further investigation into disposal methods and recycling as well as new technologies to monitor landfills industrial mining wastes and chemical and nuclear repositories This creates a need for more research on current disposal methods such as landfills incineration chemical and effluent treatment as well as recycling clean technologies waste monitoring public and corporate awareness and general education The papers contained in this title form a collective record of scientific information and work on the current situation of waste management amongst professionals researchers government departments and local authorities

Hazardous Waste Management Zarook

Shareefdeen, 2022-04-22 This book provides readers with the most current knowledge on hazardous waste management practices It addresses the rapidly changing advances in waste stream characterization and the discovery of new chemicals which have led to new hazardous wastes technological innovation stringent environmental regulations changes in transport and dispersion modelling of hazardous pollutants and new waste management techniques Hazardous Waste Management Advances in Chemical and Industrial Waste Treatment and Technologies is an invaluable reference for waste management and treatment professionals chemical engineers and technicians medical professionals and environmental regulators as well as students taking courses on hazardous waste management environmental engineering and environmental science

Energy and Sustainability V: Special Contributions C.A. Brebbia, S.S. Zubir, 2015-03-19 This volume contains special contributions presented at the 5th International Conference on Energy and Sustainability held by the Wessex Institute of Technology It is a companion to the Volume containing most of the contributions Vol 186 of WIT Transactions on Ecology and the Environment and comprises papers presented orally during the Conference The modern world is highly dependent on the exploitation of fossil fuels More recently resources depletion and severe environmental effects deriving from the continuous use of these fuels has resulted in an increasing amount of interest in renewable energy resources and the search for sustainable energy policies The changes required to progress from an economy mainly based on hydrocarbons to one taking advantage of sustainable energy resources are massive and require considerable scientific research as well as engineering

systems The effect also involves collaboration between different disciplines in order to arrive at optimum solutions including buildings energy networks convenience systems new energy storage solutions waste to energy technologies and many others This book along with its companion volume covers topics related to sustainability in energy and power production storage distribution and management These include Energy Policies Renewable Energy Resources Sustainable Energy Production Environmental Risk Management Green Buildings Energy Storage Biofuels Processing of Oil and Gas Drilling and Well Design CO2 Capture and Management Pipelines Energy Efficiency Energy from Waste Energy and Transportation *Waste Management and the Environment VIII* C.A. Brebbia, H. Itoh, 2016-07-14 Waste Management and the Environment VIII contains papers present at the 8th International Conference on Waste Management and the Environment organised every two years by the Wessex Institute The contents were contributed by professionals researchers government departments and local authorities and cover the current situation of waste management Waste Management is one of the key problems of modern society due to the ever expanding volume and complexity of discarded domestic and industrial waste There is a need to establish better practices and safer solutions for waste disposal This requires further investigation into disposal methods and recycling as well as new technologies to monitor waste disposal sites clean technologies waste monitoring public and corporate awareness and general education Unfortunately many of the policies adopted in the past were aimed at short term solutions without regard to the long term implications on health and the environment leading in many cases to the need to take difficult and expensive remedial action The development of sustainable strategies is the preferred trend for Waste Management The approach which has emerged as the most promising has been called 4Rs where reduction reuse recycling and recovery including the sale of waste as Secondary Raw Materials SRM and of Refuse Derived Fuel RDF are seen as the best actions This largely decreases the volume of waste that needs final disposal Contents cover such topics as Environmental impact Reduce reuse recycle and recovery 4Rs Waste incineration and gasification Energy from waste Industrial waste management Hazardous waste Agricultural waste Wastewater eWaste Landfill optimisation and mining Remote sensing Thermal treatment Emergent pollutants Environmental remediation Direct and indirect pre treatment of MSW Disposal of high level radioactive waste Legislation Behavioural issues Sustainable Development and Planning VI C. A. Brebbia, 2013-05-01 This book contains the proceedings of the sixth conferences on the topic of sustainable regional development organized by the Wessex Institute of Technology First held in 2003 the conference facilitates communication between all scientists specialising in the wide range of subjects included within sustainable development and planning These include planners environmentalists architects engineers policy makers and economists who all must work together in order to ensure that planning leads to sustainable development that meets present needs without compromising our future The papers included in the book cover Regional planning City planning Sustainability and the built environment Cultural heritage Environmental management Resources management Social and political issues Rural developments Sustainable solutions in

developing countries Transportation Energy resources Environmental economics **Handbook of Water Harvesting and Conservation** Saeid Eslamian, Faezeh Eslamian, 2021-03-01 Water harvesting is gaining more and more recognition as a sustainable and resilient water supply options It is economically viable socially compatible and environmentally friendly Water harvesting has proven to be a robust solution to overcome or reduce water shortages all over the world It is important to understand how to apply this practice in a sustainable and effective way to make full use of its potential in a world increasingly threatened by water scarcity The Handbook of Water Harvesting and Conservation Basic Concepts and Fundamentals is the most comprehensive up to date and applied handbook on water harvesting and conservation yet published The book s 30 chapters written by 84 outstanding international experts from approximately 20 selected countries faced by drought explore critique and develop concepts and systems for water harvesting The editors bring together many perspectives into a synthesis that is both academically based and practical in its potential applications The Handbook of Water Harvesting and Conservation Basic Concepts and Fundamentals is an important tool for education research and technical works in the areas of soil water and watershed management and is highly useful for drought strategy planning flood management and developing techniques to adapt to climate change in urban agricultural forest and rangeland areas

Waste Management and the Environment V Viktor Popov, H. Itoh, U. Mander, C. A. Brebbia, 2010 The International Conference on Waste Management and the Environment is organised every two years by the Wessex Institute of Technology in collaboration with other institutions This fifth conference follows the success of previous meetings held in C diz 2002 Rhodes 2004 Malta 2006 and Granada 2008 Waste Management is becoming one of the key problems of the modern world an international issue that is intensified by the volume and complexity of domestic and industrial waste discarded by society Unfortunately many of the practices adopted in the past were aimed at short term solutions without sufficient regard or knowledge for long term implications on health the environment or sustainability and this in many cases is leading to the need to take difficult and expensive remedial action With our growing awareness of the detrimental environmental effects of current waste disposal there is a significant onus of accountability for effective waste management Better practice and safer solutions are required Not only is there a need for more research on current disposal methods such as landfill incineration chemical and effluent treatment but also on recycling waste minimisation clean technologies waste monitoring public and corporate awareness and general education **Waste Management and the Environment IV** M. Zamorano, 2008 This book brings together papers from the Fourth International Conference on Waste Management and the Environment and will be of interest to environmental engineers local authority representatives waste disposal experts research scientists in the area of waste management civil engineers and chemical engineers Proceedings of the 52nd Purdue Industrial Waste Conference 1997 Conference Purdue Research Foundation, 2020-02-06 The 52nd Purdue Industrial Waste Conference showcased 18 sessions on subjects such as biological aspects physical chemical aspects oil and petroleum wastes

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