

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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A. C. Sheehan, Pollution Research Unit



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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

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

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Biological Treatment of Hazardous Waste Landfill Leachate Using an Anaerobic/aerobic Process Paul Allan Brochi,1991 *The Aerobic Treatment of Landfill Leachate Using Rotating Biological Contactors* A. C. Sheehan,Pollution Research Unit,1988 *Aerobic Biotreatability Studies on Sanitary Landfill Leachate* Donald Francis Storrier,1975

Adsorptive Biological Treatment Of Landfill Leachate Yunus Pamukoglu,2013-01 Early biological treatment studies with the raw leachate did not yield high COD and nitrogen removals In order to improve biological treatability the landfill leachate was subjected to pretreatment by chemical coagulation flocculation followed by air stripping of ammonia The pretreated leachate was subjected to aerobic biological treatment in an aeration tank by fed batch operation In order to improve the extent of COD and ammonium nitrogen removals pretreated leachate was subjected to adsorbent supplemented biological treatment in an aeration tank operated in fed batch mode by using powdered zeolite PZ and powdered activated carbon PAC as adsorbents Chemical oxidation was used to further reduce COD content of landfill leachate after PAC added biological treatment Three oxidizing agents H₂O₂ Fenton's reagent NaOCl were used in different concentrations for chemical oxidation

Landfill Leachate Treatment Techniques Salah Souabi,Abdelkader Anouzla,2024 This book is a ready reckoner of recent information regarding the impact of leachate landfills leachate treatment and heavy metals on a single platform The amount of waste is constantly growing due to population growth and the evolution of socioeconomic activities Burying this

waste produces leachate a contaminated effluent created during the decomposition of organic waste and containing harmful substances like heavy metals polyphenols volatile organic compounds and microorganisms These effluents emit unpleasant odors associated with ammonium ions These discharges significantly impact the environment As a result the master s and doctoral academics researchers and students will be able to comprehend the most recent developments in municipal solid waste landfill operations supporting their research This book inspires readers on how to deal with environmental pollution problems due to leachate contamination in freshwater and agricultural soils using a variety of technologies Aerobic Biological Stabilization of Sanitary Landfill Leachate Edward G. Foree, Emil Norwood Cook, University of Kentucky, 1972

The Aerobic Treatment of Landfill Leachate S.P. Davies, J.E. Kitchin, University of Manchester Institute of Science and Technology. Chemical Engineering, 1993 *Landfilling of Waste: Leachate* Thomas H. Christensen, 1992 *A Review and Performance Assessment of Aerobic Biological Leachate Treatment at the Bryn Pica Landfill Site* Stuart Colin Turner, 2008

Treatment of Landfill Leachate Using Rotatory Biological Contractor Shabnam Hussain, Renu Dhupper, Aasif Mujtaba, 2012 Concern for environmental protection has increased from a global viewpoint due to the exponential population and civilization growth accompanied by the rapid generation of municipal and industrial solid waste which creates the most instringent paradox around the world Sanitary landfills are considered as most indispensable solid waste management strategy for sustainable disposal but such implementation is handicapped by the inherent drawback of landfill leachates The leachate being extremely toxic in nature are threat for the surrounding soil groundwater and surface water Aerobic treatment in the form of attached growth biomass systems is considered effective in removal of organic matter from the leachate The biological oxidation and biosynthesis of organic matter present in leachate is done by the microorganisms used in the treatment process The process is effective as compared to the other conventional anaerobic treatment of leachate as along with the organic matter harmful ammonical nitrogen can also be conventionally removed Among all the technologies available for leachate treatment RBC Rotatory Biological Contractor is the most cost effective and efficient Aerobic Treatment of Landfill Leachate Using a Submerged Membrane Bioreactor Sara Sadri, 2005

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