UP-FLOW ANAEROBIC SLUDGE BLANKET (UASB) REACTOR TO TREAT LANDFILL LEACHATE UNDER TROPICAL CONDITION

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(19232 X)

Degree of Master of Science

Department of Civil Engineering

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Thesis submitted in partial fulfillment of the requirements for the degree Master of Science

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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ABSTRACT

With the growth of population and changing the lifestyle, solid waste generation and management has become the major problem all over the world. Open dumping of solid waste has created problems related in health and the living standards of the people. Leachate generated from open dumping has created problems such as, surface and ground water pollution and soil contamination with toxic compounds.

This study was conducted to investigate the applicability of Up-flow Anaerobic Sludge Blanket (UASB) reactor to leachate treatment under the ambient temperature condition. Treatment efficiencies were measured in terms of COD reduction percentage of leachate that fed to the UASB reactor. The reactor was operated 94 days at different Hydraulic Retention Times (HRT) with the objective of finding the optimum HRT value. Maximum COD removal efficiency of (64 ± 1) % was achieved when HRT was at 6 hours. Reactor inside pH was controlled within the range of 6.2 – 7.5. Gas production rate, composition and Oxygen Reduction Potential (ORP) were measured for all the HRT values to maintain the reactor in proper anaerobic condition. Methane composition in biogas produced was high for all HRT values and at 6 hours HRT it was (86.11±1.1) %. Maximum TSS removal efficiency of 66% was also achieved at 6 hours of HRT. But maximum VSS removal efficiency of 29% was achieved at 7 hours of HRT. When comparing the heavy metal removal, the highest removal efficiencies were achieved for Pb and Cr which are (55 ± 1)% and (47 ± 1) % respectively.

Key Words: Leachate, Up Flow Anaerobic Sludge Blanket (UASB) reactor, Hydraulic Retention Time (HRT), Anaerobic Process

DEDICATION

I dedicate this thesis to my parents who have devoted their lives to make me an educated and a successful person. I would like to express my love and appreciation for the encouragement and the sacrifices made by them.

I also dedicate this thesis to my husband who gave great support and encouragement to successfully complete this research work.

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LIST OF ABBREVIATIONS

Abbreviation	Description
MSW	Municipal Solid Waste
COD	Chemical Oxygen Demand
BOD	Biological Oxygen Demand
SS	Suspended Solids
TSS	Total Suspended Solids
VSS	Volatile Suspended Solids
T-N	Total Nitrogen
T-P	Total Phosphorous
UASB	Up-flow Anaerobic Sludge Blanket
HUASB	Hybrid Up-flow Anaerobic Sludge Blanket
EGSB	Expanded Granular Sludge Bed
HRT	Hydraulic Retention Time
SRT	Solid Retention Time
ORP	Oxygen Reduction Potential
RBC	Rotating Biological Contactors
OLR	Organic Loading Rate
VFA	Volatile Fatty Acid
SBR	Sequential Batch Reactor