

THE REMOVAL OF NUTRIENTS IN SANITARY LANDFILL LEACHATE

By

MUNARITA BINTI MANSOR

Under the supervision of

Prof. Madya Lee Kok Kheng

Submitted in partial fulfillment of the requirements for the

B.Sc. (Hons) in Applied Chemistry

Faculty of Applied Science

Universiti Teknologi MARA

Shah Alam

October 2000

ABSTRACT

The results obtained in the study showed that 45% ammonia-nitrogen were removed by 10% seed in the leachate and the removal percentage was increased to 81% by incorporating 5g granular activated carbon (GAC). In the dephosphatation study, 32% of phosphorus were removed by 10% seed and this was further enhanced to 78% with 5g GAC added. The above findings showed that after 21 days, sewage seeding and granular activated carbon have the potential to remove nitrogen and phosphorus. However, GAC when compared to sewage was more efficient in reducing the nutrient concentrations. The low nitrogen removal efficiency by 10% seed was probably due to the fact that high concentration of ammonia inhibits the nitrification process.

ACKNOWLEDGEMENT

Bismillahirrahmanirrahim.

Alhamdulillah, in the name of Allah, I am very grateful for HIM to give the strength and opportunity to finish my thesis project and finally finished doing my report successfully.

First and foremost, I, Munarita binti Mansor, would like to thank my supervisor Prof. Madya Lee Kok Kheng and my co-supervisor Mr. Lee Hung Kiong for supervising me in completing my thesis project. I would like to thank them for their knowledge, guidance and encouragement in making this task a success.

I would like to extend my thanks to En. Azmin bin Abu, En. Kadim, En. Rozali, En. Johari, En. Nordin, and other Chemistry laboratory and Microbiology laboratory technologist for their assistance and concern in completing the task that have been given to me.

Last but not least, I also would like to express my gratitude to my fiancé, my classmates and housemates for their support.

TABLE OF CONTENT		Page
ABSTRACT		i
ACKNOWLEDGEMENT		ii
TABLE OF CONTENT		iii
LIST OF TABLES		vi
LIST OF FIGURES		vii
LIST OF PLATE		viii
CHAPTER		
1	INTRODUCTION	1
2	LITERATURE REVIEW	3
	2.1. Leachate	3
	2.1.1. Leachate generation	3
	2.1.2. Landfill age	7
	2.1.3. Chemical composition of leachate	7
	2.1.4. Nature of problem	7
	2.1.5. Environmental pollution by nitrogen	9
	2.1.6. Environmental pollution by phosphorus	10
	2.2. Leachate treatment	11
	2.2.1. Biological leachate treatment	12
	2.2.2. Nitrification-denitrification	12
	2.2.3. Chemical-physical leachate treatment	14
	2.2.4. Removal of pollutants by activated carbon	15
	2.3. Microorganisms	17

CHAPTER 1

INTRODUCTION

As water percolates through solid wastes that have been deposited in a landfill, it dissolves organic and inorganic components and decomposition products, giving rise to a polluted liquid known as leachate. Leachate contains many constituents, and its quality is multidimensional. Much can learn about the status or age of refuse within a landfill by monitoring leachate quality. The basic processes of waste decomposition affect the characteristics of the landfill gas and the quality of the leachate. This information is very important in designing the leachate treatment system for the present situation and for projecting likely changes that will occur (Edward *et al.*, 1995).

The leachate usually contains high concentrations of nitrogen and phosphorus (Robinson and Maris 1982). Hence, it is necessary to reduce nitrogen and phosphorus from the leachate. Nitrogen and phosphorus are basic nutrients that are essential to the growth of plant in nitrate form. The excessive concentration of nitrate in leachate when drained into waterways encourages rapid growth of microscopic plants, called algae. Proliferation of algae, will degrade water quality, and this problem is referred to as eutrophication. Eutrophication is the process whereby water such as lake become enriched with nutrients and the concomitant oxygen depletion in natural water bodies that make water undesirable for human use, both for water supplies and recreation.