

**TRANSFORMATION OF NITROGEN AND SULPHUR
COMPOUNDS IN MUNICIPAL WASTEWATER UNDER
CHANGING ANOXIC/ANAEROBIC CONDITIONS**

By


MUHAMMAD HAZRIN BIN YACOB

Report is submitted as the partial requirement for the degree of
Bachelor of Engineering (Hons.) Civil

**UNIVERSITI TEKNOLOGI MARA
NOVEMBER 2008**

DECLARATION BY THE CANDIDATE

I MUHAMMAD HAZRIN BIN YACOB, 2006876894 confirm that the work is my own and that appropriate credit has been given where reference has been made to the works of others.

()

ABSTRACT

The formation of hydrogen sulphide in the sewer networks is caused by anaerobic processes. It leads to various problems namely corrosion, health risk and odor. Anoxic processes are proven effective in previous studies in controlling its formation. However the lack of fundamental knowledge on the pathway and kinetics of anoxic/anaerobic transformations of wastewater in sewers inhibits the engineering applications of hydrogen sulphide control. This study focus on establishing the transformation rates of selected nitrogen and sulphur compounds during transformation of wastewater under changing anoxic/anaerobic conditions. It involved taking wastewater samples from the inlet of the wastewater treatment plant located at Mawar College, UiTM and running of batch biofilm reactors. The wastewater samples were analysed using Ion Chromatograph to determine the concentrations of nitrite, nitrate, sulphate, sulphide and thiosulphate. This study considers transformations taking place in the bulkwater and sewer biofilm phases only. It was found that during anoxic condition, the two stages denitrification did not occur and sulphate had undergone oxidation and reduction process. It was established that under anoxic conditions, the transformation rates of $\text{NO}_3\text{-N}$, $\text{NO}_2\text{-N}$, $\text{SO}_4\text{-S}$, $\text{SO}_3\text{-S}$ and $\text{S}_2\text{O}_3\text{-S}$ are 0.8, 0.06, 0.06, 0 and 0 mg/l/hr respectively. On the other hand, under anaerobic conditions, the transformation rates of $\text{NO}_3\text{-N}$, $\text{NO}_2\text{-N}$, $\text{SO}_4\text{-S}$, $\text{SO}_3\text{-S}$ and $\text{S}_2\text{O}_3\text{-S}$ are 0, 0, 0.03, 0 and 0 mg/l/hr respectively.

ACKNOWLEDGEMENT

First and foremost, I would like to take this opportunity to express my sincere gratitude and appreciation to my supervisor, Professor Ir. Dr. Suhaimi Abdul Talib for his guidance, advices, critics, motivation and friendship. Without his continued support and interest, this study would not have been the same as presented here.

I would also like to extend my sincere appreciation to the following panels; Associate Professor Ir. Dr. Aminuddin Baki and Associate Professor Dr. Ismail Atan for their helpful comments, opinions and recommendations during the proposal and final presentations.

I would like to add my friends into my list of appreciation who have provided precious assistance at various occasions. Last but not least, my heartiest appreciation and thankful to my family members especially my parents for their unconditional precious love, warmest encouragement and tremendous support during the entire duration of my study. May Allah S.W.T reward them all.

TABLE OF CONTENTS

	Page
DECLARATION BY THE CANDIDATE	i
ABSTRACT	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	v
LIST OF TABLES	vi
CHAPTER 1: INTRODUCTION	
1.1 Background	1
1.2 Problem Statement	2
1.3 Objectives	3
1.4 Scope of Work	
1.5 Assumptions and Limitations	
1.6 Significance of Study	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction to Sewer	6
2.2 Wastewater Characteristics	7
2.3 Microbial Transformation in Wastewater	8
2.4 Biofilm and Its Characteristics	9
2.5 Microbial Transformations	10
2.6 Biological Sulphate Reduction	11
2.7 Denitrification	12
2.8 Control of Hydrogen Sulphide in Sewers	14
2.9 Concluding Remark	15
CHAPTER 3: METHODOLOGY	
3.1 Sampling Location	16
3.2 Sampling Method	17
3.3 Reactor Design	18
3.4 Growth of Biofilm in Batch Reactor	19
3.5 Experimental Procedure	
3.6 Analysis of Samples	21
CHAPTER 4: RESULTS AND DISCUSSIONS	
4.1 Introduction	22
4.2 Analysis of First Samples	
4.3 Lessons Learnt from the Experiment	25
4.4 Analysis of Second Samples	26
CHAPTER 5 : CONCLUSION	30
REFERENCES	31