

**OXIDATION-REDUCTION POTENTIAL (ORP) DURING MICROBIAL
TRANSFORMATION PROCESSES UNDER AEROBIC, ANOXIC AND
ANAEROBIC CONDITIONS**

By

HASNITA BT AHMAD

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

UNIVERSITI TEKNOLOGI MARA

OCTOBER 2004

DECLARATION BY THE CANDIDATE

I Hasnita Binti Ahmad, UiTM no. 2001304724 declare that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The appropriate credit has been given where reference has been made to the work of others.



_____ (October 13,2004)

TABLE OF CONTENTS

DESCRIPTION	PAGE
LIST OF FIGURES	i
LIST OF TABLES	iii
LIST OF ABBREVIATIONS	iv
LIST OF APPENDICES	v
ABSTRACT	vi
CHAPTER	
1 INTRODUCTION	
1.1 General	1
1.2 Problem Statement	3
1.3 Objectives	4
1.4 Significance Of Study	4
1.5 Scope of Work	5
2 LITERATURE REVIEW	
2.1 General	7
2.2 In-Sewer Processes	8
2.3 Sewer As A Bioreactor For Microbial Process	9
2.3.1 The Role Of Microorganisms	10
2.4 Microbial Process In Sewer Network	13
2.4.1 Aerobic Transformation	15
2.4.2 Anoxic Transformation	16
2.4.3 Anaerobic Transformation	16
2.5 Redox Potential	17
2.6 Wastewater Characterization	21

ABSTRACT

The sewer is an integral part of the urban wastewater system. The sewer can also act as a reactor, where the quality of the wastewater is affected by microbial changes during the transportation of the wastewater in the sewer. However, due to the lack of fundamental knowledge in oxidation-reduction potential (ORP) in bulk water phases under aerobic, anoxic and anaerobic conditions, the efforts towards modeling and design of sewer network incorporating the processes dimension is being restrained.

The purposes of this study are to establish the change in ORP during microbial transformation processes in the bulk water phase under sewer condition and to establish the range of ORP under aerobic, anoxic and anaerobic conditions.

This study is based on experimental works on microbial transformation processes in the bulk water phase of municipal wastewater. Test on 7 different municipal wastewater samples taken from the inlet of wastewater treatment plant (WWTP) at Mawar College and a manhole, near the Civil Engineering Laboratory were conducted. Two types of reactors were used in this study. The first reactor, subjected to aerobic conditions was used to determine the amount of substrate utilized by analyzing the OUR curve. The second reactor, subjected to aerobic, anoxic and anaerobic conditions was used to measure the ORP value and to determine the amount of dissolved oxygen, nitrate/nitrite and sulfate used during the aerobic, anoxic and anaerobic conditions.

KEYWORDS

Microbial transformation processes; aerobic, anoxic and anaerobic conditions, in-sewer processes, oxidation-reduction potential, initial COD-fractions, nitrate, nitrite, sulfate, oxygen utilization rate.

CHAPTER 1 INTRODUCTION

1.1 General

In Malaysia, the sewerage system has conventionally been considered to comprise of sewers networks and wastewater treatment plants (WWTPs). The sewer systems have been designed solely to perform mass transport, while WWTPs are considered stand-alone units, designed to remove/reduce pollutants to an acceptable level before discharging to the receiving environment. Sewerage system can be generally represented by components shown in Figure 1.1.

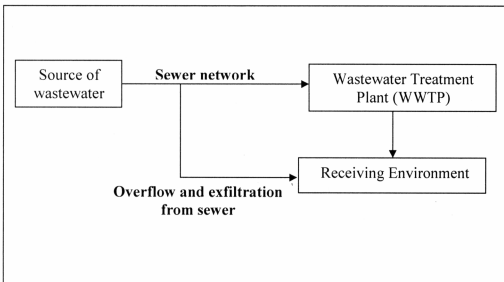


Figure 1.1: The conventional view-Components of a Sewerage System
(Abdul-Talib *et al.*, 2000)