



CHAPTER I

INTRODUCTION

During the east decade, the environment has been deteriorated as resulted from human activities. Pollutants including wastewater from factories are, frequently, discharged to canals, rivers, seas and oceans. These waste products would increasingly pollute water sources up to dangerous level for lives in water and finally man.

Hence, pollution is currently regarded as the moment-to-moment serious problem, especially water pollution. Water is indispensable for life and industry; but nevertheless, the more it is consumed, the more polluted water returns. What is going on in Thailand could explicitly testify this fact wastewater was discharged from factories without pretreatment to public water ways such as canals in Bangkok, Chao Phya River, Mae Klong River. These water ways had been continuously contaminated and became subsequently polluted during the dry season. It was harmful for water animals, caused damages and annoyed people. The way to solve water pollution is Wastewater Treatment, treating wastewater to the standard quality before discharging it to public water ways. It could be carried on by various means but a popular one is Activated Sludge Process which is Aerobic Biological Treatment. This type of treatment is preferably applied as Central Treatment Plant of town or industrial estate.

In regard to the fact that heavy metals are at the moment world widely utilized in activities and industries and also with a trend of increase in consumption, the wastewater from factories would

inevitably contain heavy metal derived from the manufacturing process. For example, lead and zinc are heavy metals remained in wastewater from the following industries : Paper Mills, Organic Chemicals, Petrochemicals, Inorganic Chemicals, Fertilizers, Petroleum Refining, Basic Steelworks, Basic Non-Ferrous Metal Works, etc. Because of the possible toxin of the heavy metals, lead and zinc, towards humans and bacteria, the microbial activity in Activated Sludge Process which is Central Treatment Plant may be affected from concentration of combined lead and zinc in wastewater from these factories.

Purpose of study

The purpose of this study was to investigate the combined effects of lead and zinc on organic removal efficiency, biokinetic coefficients, nitrification and metal distribution in the system of a completely mixed activated sludge process. It will bring about the consistent operating and environment for the treatment of wastewater that present lead and zinc concentration. The advantages of this study are as follows :

1. To design and operate the activated sludge process for treating lead and zinc bearing wastewater.
2. To prevent any adverse effects on treatment efficiency resulted from lead and zinc toxicity.
3. To be used as a guideline for the study of the effects of other heavy metals on activated sludge process and as a basis for comparing the results of other heavy metals study.

Scope of study

This study was to determine the combined effects of lead and zinc on the completely mixed activated sludge process. The continuous flow operational basis was applied on bench scale reactors with internal cell recycle system. The approximate concentration of lead and zinc, in combination, were utilized as follows:

- a) 1 mg/l of lead and 1 mg/l of zinc
- b) 5 mg/l of lead and 1 mg/l of zinc
- c) 1 mg/l of lead and 5 mg/l of zinc

A synthetic wastewater of approximate 500 mg/l chemical oxygen demand (COD) was utilized throughout this study. Data from the operation of metal dosed reactors were compared to that of control reactor, undosed with lead and zinc, to investigate the combined effects of lead and zinc on the following topics:

- 1. Organic removal efficiency
- 2. Biokinetic coefficients
- 3. Nitrification
- 4. Metal distribution