CHAPTER 1

INTRODUCTION

Heavy metals in wastewater are one of the most significant problems (Apiratikul, 2004) due to their toxicity which can cause animal and human health problems after being released into the environment. According to the USEPA (1996), zinc is one of the most common metals of concern at Superfund sites (Thunsiri, 2004). Zinc is also present in wastewater streams from many kinds of industries such as electroplating and mining industries. Its concentrations in wastewater range from 7.2-1500 mg/L (Eckenfelder, 2000). Whereas the standard is only 5 mg/l (according to both the industrial effluent standards from the United State Environmental Protection Agency and Thailand Pollution Control Department).

There are several existing technologies for the treatment of metal wastes including precipitation, evaporative concentration, ion exchange and membrane processes. Among these techniques, precipitation is the most common method for metal removal for wastewaters with high heavy metal concentrations. However, this process cannot always give satisfactory metal removal to meet stringent pollution control limits, where other advanced technologies may not economically viable (volesky, 1990; Chang, 1996)

Foundry sand, the waste from the metal casting industry, has the ability to adsorb zinc in wastewater (Thunsiri, 2004). In this study, the column test would be performed to observe the adsorption column behavior in a real application.

1.1 OBJECTIVES OF THE STUDIES

The objectives of the study can be summarized as follows:

1. To investigate the column performance of the foundry sand as a medium for removal of zinc in a continuous flow system.
2. To generate a set of data necessary for column design.

1.2 HYPOTHESES

1. Foundry sand can remove zinc from contaminated water.
2. Zinc removal efficiency of foundry sand varies due to the differences in bed heights, flow rates, initial concentration, pH, and styles of column operation.

1.3 SCOPES OF THE STUDY

1. Four kinds of foundry sand with known properties from batch experimental results were chosen for the column experiment.
2. Breakthrough studies were carried out to evaluate the performance of foundry sand in a continuous fixed-bed operation under different operating conditions, such as the flow rate, bed depth, and influent concentration.
3. The contaminated water was synthesized and prepared in laboratory scale.

1.4 ADVANCETAGES OF THIS WORK

1. A beneficial utilization of waste that can reduce the cost of foundry sand waste management.
2. Foundry sand can be used as a low cost effective sorbent for zinc removal from contaminated water.