CHAPTER I

INTRODUCTION

1.1 Statement of the problems

Heavy metals present in aqueous waste streams of many industries such as metal plating facilities and mining operation. Metals are also a persistent problem at many contaminated sites, and their presence in groundwater and soil can pose a significant threat to human health and the environment such as risk of groundwater and surface water contamination. According to USEPA 1996, the most common metals of concern at Superfund sites were lead, chromium, arsenic, zinc, cadmium, copper, and mercury.

Treatment of contaminated water to remove soluble metals has been and continued to be a technical challenge due to very low concentrations established by current regulations. Current technologies available for the removal of heavy metals from waste stream include chemical precipitation, membrane filtration, ion exchange, carbon adsorption, and co-precipitation/adsorption (Cecille et al.1991). Since capital cost and operation and maintenance commitments are high, cost-effective alternative technologies for treatment of metals contaminated waste stream are needed. Waste products from industries may have potential as inexpensive sorbents. Due to their low cost these materials could be disposed of

when their sorptive capacity is exhausted rather than regenerating and reusing (Asif et al. 2003).

Spent foundry sand, which is a by-product from metal casting operations that falls within the definition of waste under the Environment Protection Act (1993), is one of the materials that can be used as low cost sorbents. Sand casting generates residuals from metal melting, pouring, molding and core-making processes. Waste can also be from cleaning rooms, dust collectors or scrubbers. Depending upon the processes, spent foundry sand may contain a mixture of sand, clay binder, coal dust and fine residual iron particles. This sand is constituted of bentonite and, in particular, zero-valent iron. The zero-valent iron has been shown to successfully treat acidic water containing heavy metals (O'Hannesin and Gillham 1994, Cantrell 1995, Argawal and Tratnyek 1996, Blowes et al. 1997 and Lee et al. 2002). This is due to their high specific surface areas and high affinity for metals.

A previous study on reuse of spent foundry sand provides overview of several beneficial reuse options (Abichou et al. 2002, and EPA guidelines 2003). Some recycle options involve asphalt concrete, compost additive, portland cement, flowable fill and hydraulic barrier layer in landfill. Using spent foundry sand as barriers in landfills to prevent migration of leachates and infiltration have shown a good performance (Auychaiwatt 2003). However, the environmental ramifications of using spent foundry sand that might contain contaminants in environmental application are also of concerned. For this reason, it is important to study adsorption of metals by the sand. This study focuses on removal of heavy metals using spent foundry sand in batch study.

1.2 Objective of the study

The main objective of this study is to assess the feasibility of using spent foundry sand as a low-cost adsorbent for removal of zinc from groundwater.

1.2.1 To investigate the zinc removal efficiency by foundry sands.

1.2.2 To create understanding of major factors contributing the removal.

1.2.3 To enhance the removal efficiency of zinc by using a multivariate regression analysis.

1.3 Hypotheses

1.3.1 Spent foundry sand is non-hazardous.

1.3.2 Spent foundry sand has potential to remove toxic heavy metals.

1.3.3 There are other factors in foundry sand constituents that can involve in capturing heavy metals such as clay content, total organic carbon and other oxides.

1.4 Scopes of study

1.4.1 The adsorption of zinc on spent foundry sands was investigated in batch system.

1.4.2 The groundwater contaminated with zinc was synthesized and prepared in laboratory scale.

1.4.3 The significant parameters those affect sorptive capacity of spent foundry sands were investigated.

1.5 Advantage of this work

1.5.1 A beneficial reuse for foundry sand waste that can reduce the plant's storage costs.

1.5.2 Elimination the transportation costs incurred by trucking it to municipal landfills increasing in a variety of areas including the transportation, construction.