CHAPTER I

INTRODUCTION

1.1 Statement of the Problem

Sugar is produced in 121 countries and the global production now exceeds 150 million tons a year. Approximately 70% is produced from sugarcane. Demand from domestic and international markets has been rising and has contributed to the economic growth of the nation. Sugarcane growing and processing into raw and white sugar is one of the largest industries in the country, making Thailand the second largest sugar exporters in the world. There are 46 sugar mills in Thailand located around the country except the southern part.

Bagasse is cellulosic fiber residue from sugarcane after processed by sugar mill. However, as the costs of fuel oil, natural gas, and electricity have been steadily increased, bagasse has come to be regarded as a fuel rather than refuse. Cogeneration of steam and electricity has become the norm in the sugarcane industry worldwide. For Thailand, the Energy Policy and Planning Office (EPPO), formerly The National Energy Policy Office (NEPO), has set budget of 2,060 million Baht to support small power producers (SPPs) that use renewable fuels to generate and sell electricity to the EGAT. There are 43 candidates and 31 were selected. As many as 22% of the grantees use bagasse as a fuel (www.eppo.go.th, 2002). Therefore, some bagasse will become fly ash and residues.

Due to the high maintenance cost associated with precipitation, solvent extraction, ion exchange, and adsorption onto activated carbon for the removal of lead and chromium ions from wastewaters, these chemical treatments do not suit the needs of developing countries. One of the purposes of this research is to convert the wastes, raw bagasse and bagasse fly ash, into inexpensive and effective removal material for lead and chromium. However, after treated, waste was generated and this poses serious waste management problems. Therefore, the other aim of this research is to

assess the efficiencies of cementitious solidification for treatment and disposal of bagasse and bagasse fly ash which adsorbed lead and chromium.

1.2 Objectives

The main objective of the study is to utilize bagasse and bagasse fly ash to remove lead and chromium from aqueous solution by adsorption and subsequently use the spent adsorbents as cement replacement materials. The sub-objectives are as follows:

1.2.1 To determine the physical and chemical characteristics of bagasse and bagasse fly ash.

1.2.2 To study the optimal conditions of bagasse and bagasse fly ash for the removal of lead and chromium.

1.2.3 To find the optimal mix proportions of spent bagasse and bagasse fly ash to make construction materials.

1.2.4 To evaluate the mechanical properties of the bagasse-cement mortar and bagasse fly ash-cement mortars.

1.2.5 To evaluate the leachability of solidified products.

1.2.6 To evaluate the economical feasibility of using these adsorbent materials and solidified products.

1.3 Scopes of the Study

1.3.1 Collection of bagasse and bagasse fly ash samples was done at Saraburi Sugar Co., Ltd in Saraburi province, Thailand.

1.3.2 Adsorption study was done in batch experiments.

1.3.3 Concentration of lead and chromium will be determined by Atomic Absorption Spectrophotometer (AAS).

1.3.4 Study of the Morphology, chemical composition of the contaminant in solidified product, and information of heavy metal retention on materials by Scanning electron microscope (SEM).

1.3.5 Study of the pollutant leached from the solidified products according to Notification of Ministry of Industries No. 6, B.E. 2540 (1997).

1.3.6 Evaluation of the economical benefits from solidified products.

1.4 Benefits of the Study

The wastes from sugar mill and cogeneration project will be utilized. Moreover, the treatment of lead and chromium by bagasse and bagasse fly ash will be developed and improved to potentially replace of more expensive conventional methods such as precipitation, ion exchange, and carbon adsorption. As lead acetate is normally used in sugar industry for Pol measurement, which is the apparent sucrose content of any substance expressed as percentage by mass and determined by the single or direct polarization method. Bagasse and bagasse fly ash can be used to treat this hazardous waste.

Furthermore, cheaper construction materials will be developed. It is hoped that the results of this research can reduce use of Portland cement, which comes form an energy intensive and environmentally taxing process because the spent materials from adsorption process can partially replace Portland cement. The results from the experiments can be further developed to treat other heavy metals by bagasse and bagasse fly ash. In addition, the procedure or framework can be used in evaluating other inexpensive and effective adsorbents from other agriculture wastes of Thailand.