CHAPTER I
INTRODUCTION

Nowadays a major portion of CO_2 emission is coming from power plants. Many methods to produce electricity have been introduced in the power plant such as wind, water and solar cell etc., but they have not enough efficiency to meet the demands, thus a combustion method cannot be avoided to help the power plant generates more electricity. The combustion method always produces flue gases, which become environmental concerns.

One of the most concerns is emission of flue gases, containing high concentration of carbon dioxide (CO_2), which could be environmentally hazardous and contributes to enhance green house effect (Supap *et al.*, 2006).

To reduce the effect of CO_2, various processes are available to remove CO_2 from such flue gas prior to being safely discharged to the atmosphere. One of the most effective ways to capture CO_2 from these gases is absorption with chemical reaction using aqueous amine solutions. The absorption process takes place in an absorber column which the amine solution absorbs CO_2 and becomes rich acid solution. The amine is then regenerated for reuse in a separate stripper column by heating. The technique is favorable to many industries, such as gas processing because it gives high CO_2 absorption efficiency, short rate of return period and commercially applicable (Epp *et al*, 2011). However, a major problem preventing the absorption process to achieve its highest efficiency is amine degradation after long term circulation; and repeated exposure to oxygen (O_2), and other reactive contaminants such as SO_x and NO_x in flue gas streams. Not only does the degraded amine not have any value in absorbing CO_2, but it also introduces unwanted compounds to the system causing more problems in absorption unit. The unwanted degradation products can be generated by many path ways i.e. one of which produces carboxylic acids formed by reactions of amine and O_2 and SO_2. These acids can react further with another amines leading to a formation of Heat stable salts (HSS). Similar to degraded amine, HSS has no ability in absorbing CO_2, which and must be removed from the amine solution because it introduces corrosion, fouling, and foaming to the absorption process (Supap *et al.*, 2011). Presently, many methods have been introduced to remove HSSs from the contaminated amine solution with a goal to replace the conventional distillation reclaiming process, which requires a larger energy input, thus higher cost to operate.

This research is interested in a liquid-liquid extraction method. The objective of this work is to study the effect of different extraction diluents to remove HSS, i.e. acetate, formate, glycolate, and oxalate from aqueous monoethanolamine (MEA) solution. The diluent are selected based on their solvation power, which helps transfer of HSS from the aqueous amine to organic diluent. Low soluble diluents in the aqueous amine phase are also required to prevent organic phase contamination. An amine extractant, extractant A, in this study is in a chloride form. The extractant A is forming complex molecules with HSS, which transfer from aqueous phase to organic phase, but the complex forms of extractant A generate corrosive products and must be converted to a less corrosive hydroxide form, which is become extractant B (unconverted chloride form and hydroxide form). After finishing the extraction, the extractant B will be recovered by a caustic that can bring HSS back from organic phase to aqueous phase for further disposal.