# CHAPTER I
# INTRODUCTION

Surfactants are widely used in many industries such as for food Industry, textile, pulp and paper, personal care processing, fire fighting, and many others. Effluents from there industries usually contain surfactants at low concentration with can cause severe water problems. As environmental regulations tighten, there is increasing concern about reducing the surfactant concentration in these effluent streams. Another source of these steams is from the surfactant-based separation processes. Owing to their low energy requirements, these processes have gained increasing interest in the applications to remove various types of pollutants from wastewater and groundwater. The resultant effluent streams from these processes usually contain surfactants, which need to be removed. In addition to satisfying the environmental regulations, the value of the surfactant in the effluent makes recovery operation economical. Micellar-enhanced ultrafiltration (MEUF) is one surfactant-based separation which shows great promise. In this process, surfactants are added to an aqueous steam containing dissolved pollutants. If a surfactant concentration is higher than the critical micelles concentration (CMC), most surfactants are present as aggregates called micelles. Multivalent ions will bind with micelles and organic contaminants will solubilize into micelles. This stream is then treated by ultrafiltration with suitable membrane having pore size enough to block the micelles but monomeric molecules still can pass through the membrane to present in the permeate at or slightly below the CMC (Scamehorn *et al.*, 1992). For environmental and economic reasons, the surfactant monomers that leak into the permeate have to be recovered. Several methods have been explored to solve this problem including the use of surfactant having low CMC, precipitation and foam fractionation.

Foam fractionation is the process used to concentrate and remove surface active agents from aqueous solution. This method is the direct treatment of the rinsing water by physical of separation that would allow for the reuse of both water and surfactants. In this process, the solute species adsorbs at the gas-liquid interface between a dispersed phase (gas bubbles) and a continuous phase (bulk liquid) resulting in remove surfactants from solution. The foam, which forms at the surface, is allowed to drain and once collapsed, to form a concentrated liquid that can be recycled in the production process. The foam fractionation column can be classified in to two categories: single-stage and multi- stage mode (Carleson, 1992).

From previous work (Sripituk, 2006), the recovery of cationic surfactant (Cetylpyridinium chloride, CPC), nonionic surfactant (Polyethylene glycol tertoctylphenyl ether, $OPEO_{10}$) and mixed cationic/nonionic (CPC and $OPEO_{10}$) surfactants from water by multistage foam fractionation in a bubble cap tray were investigated. Effect of feed concentration, air and liquid flow rates, foam height, feed position, bottom reflux position and bottom reflux ratio were examined. In this work the recovery of cationic surfactants (Hexadecylpyridinium bromide, Hexadecyltrimethylammonium bromide (CTAB), Tetradecyltrimethylammonium bromide, and Dodecyltrimethylammonium bromide) were investigated. Effect of tail length and salinity were examined. This research involves the study of variables on efficiency of a foam fractionation operation in a pilot-scale fractionator.