CHAPTER III

EXPERIMENTAL SECTION

3.1 Materials

Activated carbon was a standard vapor phase carbon, BPL 4x10 from calgon with a nitrogen BET surface area of 1050-1150 m^2/gram. The surfactant was sodium dodecyl sulfate (SDS) from Henkel. The solute used was trichloroethylene (TCE) that is an analytical grade. The air was zero grade from Thai Industrial Gas and double distilled water was used throughout all experiment

3.2 Methodology

The temperature for the column was maintained with a high temperature circulator bath. The constant flow rate both of the regenerant solution and flushing water were controlled by a masterflexlaboratory/standard pump. The jacket column has a 1 inch diameter and 3 feet long from Rainin. An adjustable plunger was inserted to contain only 25 gram of carbon in order to minimize the void volume exited in the bed. One pore volume correspond to the entire volume of void in adsorber bed that is needed to fill with water. In this experiment, the carbon 25 gram corresponded with 30 mL of water (1 pore volume of 25 gram of carbon equivalent with 30 mL of water). Regenerant solution should be mixed well by using magnetic stirrer before pass through the carbon bed. And for plugging problem in the connection along the line

both of regenerant solution and flushing water should be filtrate before feeding them through the line.

The activated carbon was treated before it was packed into the column, desalting and cleaning of activated carbon surface by heating activated carbon in water in the temperature 80 ^{o} C for 1 day and then rinsed many times with distilled water until the conductivity water reached pure distilled value after that activated carbon was dried for 5 days in the furnace at 80^{o} C and was kept it in a desicator until starting of experiment.

The TCE concentration was analyzed by Gas Chromatography (GC) and the SDS concentration was analyzed by a conductivity meter.

There are 2steps in this experiment.

1) Adsorption

2) Regeneration

2.1 Rinsing with surfactant solution

2.2 Flushing with distilled water

2.3 Drying

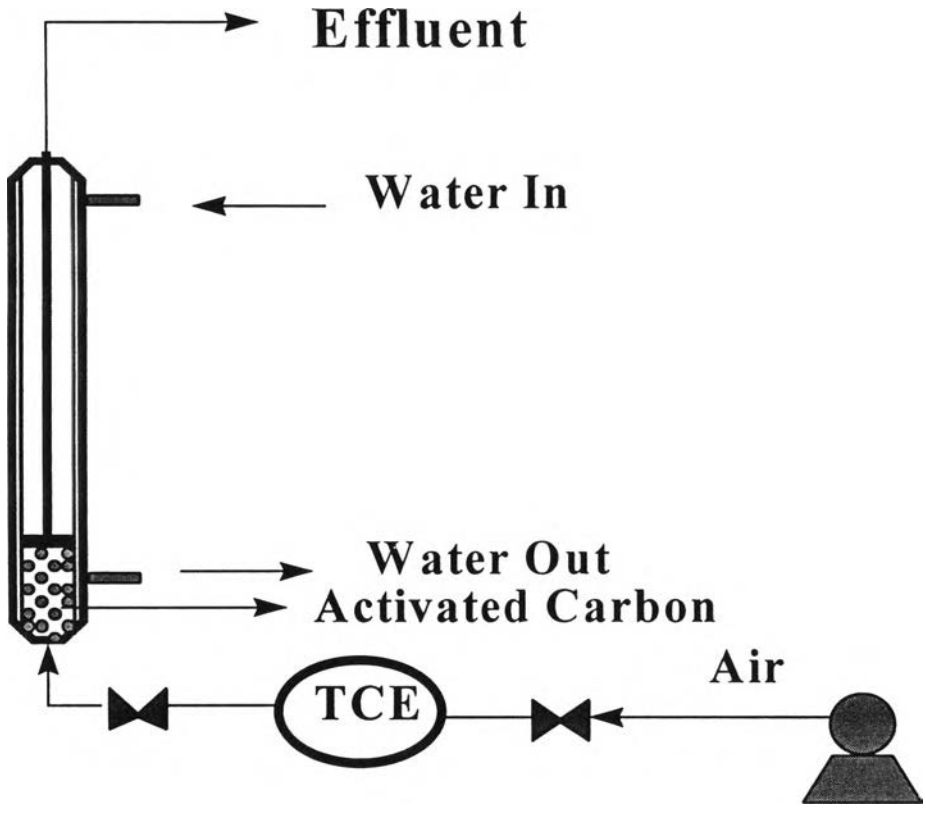

Figure3.1 Schematic diagram of adsorption step.

To begin with the adsorption step, the TCE was evaporated using pressurized air and mixed with another air line to adjust the TCE concentration to 1000 ppm after that it was fed into the column with the approximately 1.0 L/sec flow rate in an upflow direction until the effluent concentration reached the feed concentration. A mass balance on the breakthrough curve was done to determine the total amount of adsorbed TCE. A schematic diagram for adsorption step is shown in Figure 3.1.

Before starting the regeneration step, the bed was wetted with the low flow rate to avoid foaming which can lead to severe channeling or plugging of the column.

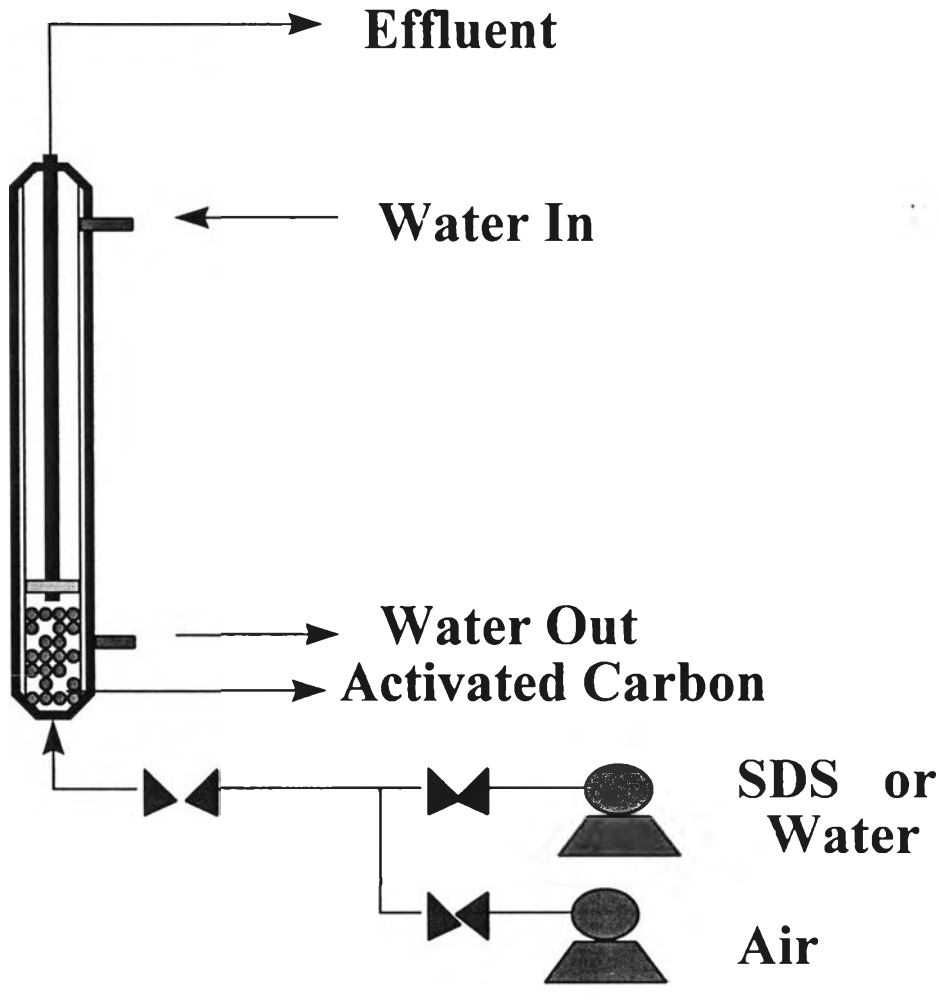

Figure3.2 Schematic diagram of regeneration step.

From Figure3.2 in the regeneration step, the regenerant concentration contained 0.025 M SDS was pumped through the column at the flow rate 40 mL/min with an amount 4,700 pore volume or 141 L, both concentration of TCE and conductivity of SDS are detected in the effluent regenerant solution. By analysis of the effluent and knowledge of the amount of organic originally adsorbed on the carbon bed allowed a calculation of fractional recovery at any point during the run.

Following rinsing activated carbon column by regenerant solution with the water rinsing by pumping the double distilled water through the carbon bed at 10 mL/min flow rate in the variable amount none, 500 pore volume (15L).

Following the water rinsing, the activated carbon should be dried before start to the next sequence by increasing the jacket temperature on the column to 50 ^{o}C and compressing air from a diaphagm air pump to increase effectiveness. This drying step took time for 48 hrs to dry activated carbon completely.