CHAPTER I

INTRODUCTION

1.1 General Background

There are a lot of plating shops in Bangkok's area, ranging from small-job shops to large factories working for specific products, e.g., parts of automobiles and motor-bicycles. Most of these shops and factories discharge their wastewater to municipal drainage, river and/or canals without any treatment. Quantities and characteristics of wastewater of each factory and different, depending on their manufacturing process, size and shape of workpieces, components of plating solution, etc., Generally, they contain a variety of chemical compounds which may be toxic to aquatic life and humans. The most toxic compounds are cyanides, acids and metals, such as chromium, zinc, copper and nickel.

Metals can be removed by chemical treatment which convert them to their more stable forms and precipitate out as sludge. In case of hexavalent chromium removal, reducing agent, such as, ferrous sulfate, sodium bisulfite, or sodium sulfite will be used under acid condition in order to convert toxic hexavalent chromium to less toxic trivalent chromium and trivalent chromium will be precipitated as chromium hydroxide under basic condition. The chemical wastewater treatment plants need quite a large area and

the valuable trivalent chromium in sludge will also be disposed of without any reuse. On the other hand, ion exchange process is designed not only to remove the chromium from the waste stream but also to reclaim the chromium to be used in the plating process. Besides, the treated water shall as well be used as rinse water in the manufacturing process.

1.2 Purposes of Research

1) To study the electroplating process and their sources of wastewater.
2) To study the background and operations of ion exchange process.
3) To investigate the possibility and efficiency of the chromium waste treatment using the ion exchange process.
4) To determine the optimum concentration of the sodium hydroxide regenerant for the strong base anion exchanger (SBA) column so as to obtain the maximum chromic acid concentration.
5) To examine the effects of different regeneration flowrates on the chromic acid reclamation.
6) To study the relationships between the concentrations of sodium hydroxide regenerant and the sodium dichromate solution, as well as their influences on the recovered chromic acid concentrations.

1.3 Scope of investigation

In the experiments, steps of electroplating process and their sources of wastewater were studied. The wastewater were collected and their physical and chemical characteristics were analysed. Background and operations of ion exchange process were also studied so that lab-scale columns could be made for the experiments. Synthetic wastewater was passed through these columns and all the characteristics of influent and effluent were tested so that the efficiency of chromium and other heavy metal removal could be studied. The experiments were concentrated on the results of the regeneration of SBA column with sodium hydroxide at different concentrations, regeneration levels and contact times.

Once the optimum concentration of sodium hydroxide regenerant was determined, different regeneration flowrates were investigated. From the obtained data including the characteristics of the recovered chromic acid, all factors that effect the recovery of chromic acid were evaluated.