1 INTRODUCTION

1.1 Motivation and statement of problem
The amount of wastewater coming from the industrial activities keeps increasing by each passing year. This brings forward the concern on its effects towards the environment after being released into the surrounding. It is due to this fact that the process that enables the treatment of wastewater is becoming increasingly important. Several processes have been developed to treat the wastewater to meet the minimum concentration allowed for the wastewater release. However, the condition of the wastewater treatment process must also be considered as it will give impact to the cost of operation of the whole plant.

Acetic acid can be found in the textile wastewater because of its general use in cotton fibre dyeing. The acetic acid waste streams are being produced in large quantities by many petrochemicals, process and fine chemicals industries which are using acetic acid as a chemical reagent for the production of many chemical compounds. Furthermore, some of the oxidation process of wastewater with the use of hydroxyl radicals might form acetic acid as an intermediate or final product due to the oxidation. Not only that, the presence of acetic acid can affect significantly the wastewater characteristics because of the high COD values which it brings about.

Some of the industry recycles back the acetic acid in their wastewater if the concentration is high. However, the remaining acetic acid in the wastewater with a low concentration usually cannot be recycled, and there is a problem to oxidize it as it is a compound that is difficult to oxidize.

A numbers of conventional methods have been utilized for the wastewater contaminated with the organic and inorganic compound. Among them are the adsorption, reverse osmosis, and also distillation process. Unfortunately, most of the processes are not economically efficient, especially when the wastewater is produced in large quantity. Therefore the industries are in need of alternative processes that are not only efficient in terms of the process, but also economically viable and at the same time is environmental friendly.

Other technologies that have been used to treat wastewater efficiently are Advanced Oxidation Processes (AOPs), which appear to be promising field of study as
wastewater treatments. AOPs include several techniques such as ozonation, Fenton, photo-Fenton, photocatalysis, wet oxidation process, and also catalytic water oxidation process (Yang, 2008).

1.2 Objectives
The following are the objectives of this research:
  - To study and characterize the Palladium over alumina oxide
  - To study the effect of important parameter to the wastewater treatment process

1.3 Scope of this research
The following are the scope of this research:
  i) Construction of experimental rig for gas-liquid and solid-liquid stirred tank performance analysis
  ii) Experimental analysis of hydrodynamics and performance of gas-liquid stirred tank
  iii) Experimental analysis of hydrodynamics and performance of solid-liquid stirred tank

1.4 Main contribution of this work
The following are the main contribution of this research:
  - Discover the oxidizing capabilities of Palladium towards the acetic acid

1.5 Organisation of this thesis
The structure of the reminder of the thesis is outlined as follow:

Chapter 2 provides a description of the method of treatment of the wastewater that are being used right now. It includes the advantages and disadvantages of each method of treatment. This chapter also provide the catalyst preparation method, where several methods are available, with different precursor been mentioned such as the palladium chloride.
Chapter 3 gives a review of the chemical list that being used for the experiment, and also the list of main equipment used. It explains in details how the catalyst are being prepared and how the reaction and the analysis are being done.

Chapter 4 explains about the results of the experiments, which are the analysis of the experiments and also the catalyst characterization results. The results are being discussed in reference with the previous similar experiment.

Chapter 5 draws together a summary of the thesis and outlines the future work which might be derived from the model developed in this work.