CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Anaerobic digestion (AD) is a process that allows organic matter to be broken down by microorganism in the absence of oxygen. AD can be used to treat various organic waste to produce bio-energy such as biogas which consists mainly of methane, CH4 and carbon dioxide, CO2. Anaerobic digestion have four stages in its operation; Hydrolysis, Acidogenesis, Acetogenesis, and Methanogenesis.

Anaerobic co-digestion involves two or more types of waste in the process. Theoretically by combining different types of waste, the yield of bio-gas will be higher making this method more effective in treating waste materials. Although co-digestion may produce higher efficiency in methane production, different types of materials used have different impact on the yield of methane gas. This is because the difference in reactivity and compatibility between different materials.

Palm oil mill effluents, which are also known as POME are liquid waste product that are produced from palm oil milling factory. These liquid wastes have high polluting properties in which they release methane gas into the atmosphere and are often treated before it can be discharged into water body such as river and streams. POME are highly biodegradable due to its organic properties.

Upflow Anaerobic Sludge Blanket (UASB) is a technology that is normally used for wastewater treatment. This anaerobic digester utilizes anaerobic microorganism to form blanket of granular sludge by breaking down the organic waste that was feed into the reactor. The type of reactor used by UASB is well known for its capability to collect biogas such as
methane that is produced during digestion process within the reactor. The collected biogas can then be stored and use for various purposes.

1.2 PROBLEM STATEMENT

Contaminations of soil and water body by POME have serious impact to the environment due to the large amount of methane gas that is released into the atmosphere. Methane gas has known to be 20 times stronger than carbon dioxide to cause greenhouse effect. Due to the high yield of methane gas by this waste material, anaerobic digestion method was adapted to serve as a waste management for this material.

To prevent POME from directly discharged into the natural elements, many palm oil mills and refineries have their very own method to treat these waste material. Open pond system was widely adapted as waste treatment system for POME as it is relatively cheap and easy to install. But due to the open air properties of this method, methane gas is being released directly into the atmosphere when decomposition of POME is occurring within the pond.

Methane has variable uses ranging from cooking gas to natural gas for vehicles. In order to utilize the methane gas produced by digesting POME, Upflow Anaerobic Sludge Blanket (UASB) technology can be used. This system comprise of a UASB reactor that provides a closed environment for anaerobic digestion of POME. By doing so, the methane gas released from the digestion can be captured effectively and transported for storage for further use. This method will also help in preventing harmful methane gas from entering into the atmosphere, in which will reduce greenhouse effect.

Anaerobic digestion has proven effective in treating POME. This qualitative study will explore the performance of UASB reactor in methane production yield when co-digestion of POME with other waste materials is being adapted. This paper will study the feasibility of co-digestion of POME with other materials by obtaining methane gas production yield.

In this study, we will determine how hydraulic retention time affects the yield of methane gas from anaerobic co-digestion of POME. Hydraulic retention time measures the average of a compound stay within a confined space. This study will show the productivity of anaerobic co-digestion with the influence from hydraulic retention time. We will study the
rate of yield of methane gas using anaerobic co-digestion of POME with Upflow Anaerobic Sludge Blanket method based on the hydraulic retention time of the digesting materials.

1.3 OBJECTIVE

The objectives of the research are:

i. To study the effects of hydraulic retention time on the yield of methane in anaerobic co-digestion of POME using UASB.

1.4 SCOPE

The scopes of the research are:

i. The source of POME obtained will be consistent throughout the research.

ii. The temperature and pH value of in the UASB tank will be consistent throughout the research.

ii. Different hydraulic retention time will be studied to obtain the best methane yield.

1.5 THESIS ORGANIZATION

This thesis consists of 5 chapters. Chapter 1 describes the introduction of the research. Chapter 2 discusses the literature reviews which explain existing problem or solution and compare related works on the research. Chapter 3 discusses the methodology used in this research. Chapter 4 describes the implementation process of the technique and the analysis of result in the project. Chapter 5 contains the conclusion of the research findings.