

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Agriculture is one of the most important sectors towards the increasing of Malaysia's economy. The main crops such as oil palm, rubber and cocoa have dominated in this sector for export. Other than that, agriculture also produced the main source of solid waste and following then by industrial municipal and mining sources. Oil palm also produced a few types of wastes such as empty fruit bunch, palm oil mill effluent (POME) and palm oil fuel ash (POFA). POFA is the grey stuff with seem black which an agro-waste resulting from the incineration process at temperature about 800°C - 1000°C of oil palm residue (Jumaat, 2010).

Today researches from all over world are now focusing on how to maximizing the utilization of agricultural and mostly industrial wastes and use it in the construction industry. The utilization of these wastes product may not be economical but it will help to create a sustainable and a pollution free environment.

Presently various types of by-product materials such as fly ash, blast furnace slag, silica fume, rice husk ash and others have been widely used as pozzolanic material in concrete. Their utilization not only improves the concrete properties, but also preserves the environment (Lee et al., 2010). The use of POFA with limestone as a cement replacement material will help to improve the compressive strength and corrosion resistance of the concrete.

Most cement plants consume much energy and produce large amount of undesirable products, which affect the environment. In order to reduce energy consumption and carbon dioxide, CO₂ emission and increase production, cement manufacturers are blending or inter-grinding mineral additions such as slag, natural pozzolana, sand and limestone (Kenai et al., 2004).

Natural pozzolana has been widely used as a Portland cement replacement material in many applications. This is because it can reduce the cost, reduce the heat evolution, decrease permeability and increased chemical resistance. However they are often associated shortcomings such as the need to moist curing for longer time and a reduction of strength at early ages and up to 28 days (Kenai et al., 2004). The reactivity of limestone fillers shows the change in the C-S-H and the formation of transition zone between the filler and cement paste (Bonavetti et al., 2001; Kakali, 2000 and Heikal et al., 2000).

1.2 PROBLEM STATEMENT

Recently, there are a lot of polluted wastes that was being emitted by the factory or by any other resources in Malaysia. For example, there is an increase in amount of the emission of carbon dioxide gasses by the factory. There was also a lot of energy consumption. Therefore, utilization of industrial and

agricultural waste products in the industry has been the focus of research for economic, environmental and technical reasons.

Fly ash and silica fume are widely used as pozzolans in high strength concrete. There are also a few researches on using rice husk-bark ash or palm oil fuel ash was reported. To obtain more information of these materials, various by-product materials from industries are used to substitute Portland cement to make high strength concrete (Sata et al., 2007).

In order to investigate the effectiveness of these pozzolans which are POFA and limestone as partial cement replacement materials, a few mechanical testing and testing towards corrosion resistance will be done. The relationship when there is an addition of limestone as cement replacement material in concrete and when there is only POFA as pozzolan will be also known. Is limestone give a better result on concrete, will be investigate.

1.3 RESEARCH OBJECTIVES

The aim of this research is to study the effect of POFA with limestone as a partial cement replacement material. The related objectives of the present research are as follows:

- i. To investigate the effect of POFA with limestone as a partial cement replacement material towards concrete compressive strength.
- ii. To determine the effect of POFA with limestone as a partial cement replacement material towards corrosion resistance.