CHAPTER 1

INTRODUCTION

1.1 Introduction

Construction industry contributes altogether towards environmental degradation, and governments in numerous countries which are attempting to address the circumstance. Malaysia is no exception. Concrete is by a wide margin the most essential building material. Overall more than 10 billion tons are delivered every year. Appropriately produced concrete has great mechanical and durability properties. In any case, concrete enormously affects nature. In addition, the river sand has been utilized for the most part as fine aggregates as a part of development of pavements and other structures. Due to the fast development of the infrastructural development on the earth urges the request for river sand (Krishna Rao and Sravana, 2016). Additionally, as the supply of appropriate regular sand material close to the part of construction is getting to be depleted. The expense of the sand is also expanding.

On the other hand, Malaysia is the world second largest palm oil production. Moreover, our country accounts for the one of the largest producers and exporters of palm oil in the world. Khankhaje et al. (2016) has claimed that huge amounts of solid waste by-products in different forms such as kernels, fibers and empty fruit bunches are produced along with the crude palm oil. It is estimated that to produce one kg of palm oil, approximately four kg of dry biomass is produced. So, to save energy and fuels, these waste materials are frequently singed and utilized as a part of warming up the boilers to create power in palm oil production lines. This waste includes ash from fibers and shells which is known as palm oil fuel ash (POFA).
1.2 Problem Statement

As the second largest global palm oil producer, Malaysia has the massive daily wastage. Palm oil fuel ash (POFA) is commonly found as agricultural waste that is uncontrollably dumped in landfills. An expected 10MT/year total POFA waste is produced in Malaysia alone and this amount rises every year (Awal and Hussin, 2011). Nowadays, POFA use is exceptionally constrained and unmanageable, and vast majority of it is discarded in landfills. Subsequently, it has created various ecological issues, health-related issues and also financial issues. Al-Oqla and Sapuan (2014) found that the utilizing the waste from the palm oil industry as composite material will not only enhance sustainability but will also solve the huge issues resulting from waste problems. Moreover, many researchers have revealed that this agro waste contains massive amount of silicon dioxide in amorphous form and could be utilized as partially replacement for sand or cement.

Besides, sand mining is one of great importance to the Malaysian economy. It ought to, however, be perceived that the procedures of prospecting, extracting, concentrating, refining and transporting minerals have great potential for disrupting the natural environment (Rabie et al., 1994). The morphologies of the mining territories have exhibited the effect of mining with the ability to crush the cycle of ecosystems. Physical effects of sand mining incorporate reduction of water quality and destabilization of the stream bed and banks. Mining can likewise upsets silt supply and channel structure, which can lead in a deepening of the channel and additionally sedimentation of habitats downstream. This process can also destroy river line vegetation, cause erosion, pollute water sources and reduce the diversity of animals supported by these woodlands habitats (Byrnes and Hiland, 1995). Therefore, the recommendation made in this paper is to partially replace sand with unground palm oil fuel ash (UPOFA) in concrete and determine its properties.
1.3 Objectives

The objectives of the study are as follows:

i. To investigate the compressive strength of concrete containing various content of unground POFA as partial sand replacement.

ii. To investigate the splitting tensile strength of concrete containing various content of unground POFA as partial sand replacement.

iii. To investigate the water absorption and acid resistance of concrete containing various content of unground POFA as partial sand replacement.

1.4 Scopes of Research

This research focused on investigating the properties of unground POFA as partial sand replacement in concrete. The concrete properties those were determined through compressive strength test, splitting tensile strength test, water absorption test and also acid resistance test. In this study, two mixes had been used. Firstly, plain OPS concrete were containing 100% river sand, aggregates, water and OPC as a control mix. Another four concrete contained UPOFA as partial sand replacement, aggregates, water and OPC. The unground POFA replacement percentage is 5%, 10%, 15% and 20%.

For compressive strength test, splitting tensile strength test, water absorption test and acid resistance test, concrete cubes and cylinders had been casted in cube moulds of (100 x 100 x 100) mm$^3$ and cylinders moulds of 100mm of diameter with 200mm of height which contained the UPOFA as partial sand replacement with ratio of 5%, 10%, 15% and 20% respectively. After the cubes and cylinders were casted and demoulded, the specimens had been water cured. After 28 days the some concrete has been used for water absorption test and acid resistance test. Then, the compressive strength test, and splitting tensile strength test were conducted on 28th and 60th day of water curing. All the test and experiments were conducted according to the existing standards.