CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Cement is an important construction ingredient around the world, and as a result, cement production is a significant source of global carbon dioxide (CO$_2$) emissions, making up approximately 2.4 percent of global CO$_2$ emissions from industrial and energy sources (Gibbs, Soyka, & Conneely, 2000). Nowadays, construction’s company seek for cement that are more lighter, durable, practical, economic and environmental sustainable materials to meets their requirement on construction. Foamed concrete also known as less density cement is the combination of cement paste and preformed foams that causes the foamed concrete to be lighter than normal concrete. Eco process pozzolan foamed concrete (EPPFC) is the mixing of cement paste with preformed foam which EPP is used as cement replacement for cement. Originally, EPP is a process from spent bleaching earth which is a solid waste originating from edible oil refinery process which generates high quantities of waste due to refining process of crude edible oil. The replacement of cement with EPP in the concrete mixture leads to the landfill, with reduction of cement usage there would be less release of carbon dioxide (CO$_2$) into the atmosphere in equivalent proportion. The usage of EPP will also reduce the cost of the project.

Eco Process Pozzolan Foamed Concrete (EPPFC) is the mixing of cement paste with preformed foam which EPP is used as replacement for cement. This study is to investigate the optimum EPP as cement replacement through a series of experimental for five types of mixture of foamed concrete namely FC with 100% of OPC as control
sample and 20%, 25%, 30%, 35%, 40% EPPFC. All the specimens have been prepared and tested to determine the compressive strength, workability, porosity and water absorption.

1.2 PROBLEM STATEMENT

Foam concrete is a lightweight material consisting of Portland cement paste or cement filler matrix (mortar) with a homogeneous void or pore structure created by introducing air in the form of small bubbles. High air contents result in lower densities, higher porosities and lower strength (Kearsley & Wainwright, 2001). In view of the importance of saving of energy and conservation of resources, it is essential to find a functional substitute of cement in manufacture of FC (Ji, He, Zhang, Liu, & Wang, 2015). Cement is one of the very important raw materials in construction industry. However, cement factory emitted Carbon Dioxide (CO₂) during the production to the surrounding. The higher rate of the construction had caused the increase rate of demand for production of cement in factory. As a result, cement production is a significant source of global CO₂ emissions, making up approximately 2.4% of global CO₂ emissions from industrial and energy sources (Gibbs et al., 2000). The amount of CO₂ emitted to surrounding is based on the amount tonnage production in factory. The production of one ton of cement production consumes about 1.6MWh energy and discharge about one tonne of carbon dioxide into the atmosphere (Narayanan & Ramamurthy, 2000). Malaysia has produced 19,500 thousands metric tons of cement in 2010 (Indexmundi, 2013). Hence, Malaysia had produced 17.55 million of CO₂ to the atmosphere. The emission of CO₂ will cause to serious greenhouse effect to the global.

1.3 SIGNIFICANT OF STUDY

This significant of this study is to learn about the performance of EPP foam concrete in mechanical properties. Besides that, this study was using EPP as the waste material is becoming useful and makes benefits to the construction industry for better and greener environment.
1.4 OBJECTIVE OF STUDY

The goal of this study is to investigate the performance of EPP in foamed concrete properties as cement replacement. The specific objectives of this study are:

a) To determine the workability and fresh density of foamed concrete
b) To determine the oven dry density and compressive strength of foamed concrete.
c) To determine the water absorption and porosity of foamed concrete

1.5 SCOPE OF STUDY

The goal of study is to investigate the performance of EPP in foamed concrete properties as cement replacement. It is focused on the influence of EPP on the workability, density, compressive strength, water absorption and porosity due to water and air curing at 7, 14, and 28 days. The study is divided into four main phases as follows:

i. Phase 1 is to prepare Portland cement, silica sand, preform foamed and Eco Process Pozzolan (EPP) and sieve analysis.
ii. Phase 2 is to prepare EPP for the cement replacement in concrete mixtures. The percentage of EPP used is based on 5 different proportion.
iii. Phase 3 is to prepare and analyse the slurry and EPP mixtures workability by using flow table test
iv. Phase 4 is to test the performance of EPP according to density, compressive test, porosity test and water absorption test.

All the material and specimens preparation are conducted based on standard code of practice design requirement of ASTM at FKASA laboratory, Universiti Malaysia Pahang, Gambang Malaysia.