

## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

There are a lot of waste being created each and every day all over the world, all of these waste products are causing a lot of problems to our environment. Therefore, many types of disposal system has been implemented to handle the waste being produced. Some of the most widely use disposal system in Malaysia are open-air landfills, illegal dumping and open burning. Due to fast pace of change in our society, the local authority face difficulties in improving the waste management system over the years. This causes most of the waste still ended up in landfills until today (Clean Malaysia, 2015).

In Malaysia, the amount of municipal solid waste is estimated to increase up to 31000 tons per day. Most of the waste produce is found to be high concentration of organic waste with high moisture content. The waste comprises 80% of food, paper, and plastics (Manaf et al, 2009).

The most adapted disposal system being use worldwide is landfill, especially in developing and poor countries. This is because landfill does not require a lot of technical skills and money. Although landfill method is cheap and easy to use, it will cause a lot of problems to our environment such as soil and groundwater contamination, unpleasant smell, the emission of greenhouse gases and the spreading of diseases by animals. Another problem that contributes to the environment pollution with landfill is leachate. Leachate may reach the surface of the ground and runoffs which causes pollution to water sources such as river or lake. The harmful substances are produced by the biological, chemical and physical degradation process in the landfill sites. (Ismail & Manaf, 2013) . Indeed, the only way to reduce and eliminate the problem cause by the waste is to utilize the waste. This can be done by adopting the 3R concept: Reduce, Reuse and Recycle.

One of the way to reduce the amount of landfills is through the reuse and recycling of the bulky waste. There are a lot of benefits of doing this, such as reduced environmental impact and avoid disposal and landfill. (European Week for Waste Reduction) Today, there are a lot of waste or byproducts from industry such as palm oil fuel ash and rice husk ash, has been reuse in construction field to reduce the use of the construction raw material and lower the construction cost. Coffee ground waste is the leftover produced from every cup of coffee made. Conventionally, coffee ground waste is known as being the waste, and useless. They are being disposed to the landfills without any treatment.

## **1.2 Background of Study**

One of the most vastly used material in the construction field is concrete. Concrete is the mixture of different materials such as cement, coarse aggregates, fine aggregates and water. However, due to the different environment at the construction site, concrete are expected to have different properties in order to work well in the desired environment. In order to fulfill the requirements, admixtures usually being added to the concrete before or during the mixing process. There are a lot of admixtures with different functions being invented over the years to be use in the concrete industry. One of the admixtures is the retarder, it functions to slow down the rate of setting of concrete. By doing this, the concrete can stay fresh for a longer period of time before it gets hardened. Spent coffee ground (SCG) are rich in sugar content (Mussatto et al, 2012). The hydrolysis of spent coffee ground can also produce industrial important sugars which are glucose, galactose and mannose (Scully et al, 2016). As sugar can be use as one of the retarding admixture, the higher the amount of sugar, the longer the setting time of the mortar (Khan & Baradan, 2002). Therefore, spent coffee ground (SCG) might possess a good characteristic to be use as retarding admixtures.

## **1.3 Problem Statement**

Coffee is one of the most famous drinks throughout the world, the production of coffee is more than 105 million tons yearly. It is among one of the most traded commodities worldwide (Murthy & Naidu, 2012). Coffee drink is made from grinding the coffee bean and brew it with hot water with a ratio of 8-20g of coffee beans per 100ml of water (Farah, 2012). However, coffee beans only can be brew once before it is

discarded. This signifies that the coffee industry produced a lot of waste yearly due to the discarding of the used coffee ground.

In Malaysia, the disposal of waste is considered as one of the largest factor that contribute to the environmental problems and continue to increase. The commonly used method for waste disposal is by landfills. Most of the landfills in Malaysia are non-sanitary landfills which are without proper engineering plan and effective in handling the waste (Moh & Manaf, 2017). In order to reduce the environmental problem, the waste products which is the spent coffee grounds (SCG) have to be utilize for this research.

#### **1.4 Objective**

If spent coffee ground (SCG) can be develop to be the retarder admixture, which usually is a waste product and available in abundance. It would be a milestone achievement for the construction industry.

The main objective of this research is to study the feasibility and utilizing the used coffee ground as the retarder admixture in concrete production and construction industry. In order to achieve the required outcome, the objectives of this research are summarized as follows:

- i. To determine the characteristic of the spent coffee ground (SCG) in terms of the elements or compound that are suitable to be used as retarder admixtures.
- ii. To determine the mechanical properties of the mortar under the effect of the spent coffee ground (SCG) as retarder admixtures.