

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Malaysia is a developing nation that aiming to be a fully developed country by the year 2020. In order to achieve the vision , engineer of today need to come up with more and more sophisticated technologies and brilliant idea to create products that will save people time, money as well as sustaining the environment. As a developing country, Malaysia desire to implement National Green Technology Policy which headed by the Prime Minister Najib Tun Abdul Razak himself. Malaysia is set to become the largest green construction sector in the South-east Asian region.

The mentioned initiative are as a result of the rising demand for energy. Gas is remain the main fuel source for generation industry however coal is getting favors in the electricity industry. According to Huang (1990), basically there is about 10% of total weight of coal burned produces ash annually in Malaysia. Therefore, every year the value of coal by-product will be increased. Recently, there are four coal fired power plant in Peninsular Malaysia which are located in Port Dickson, Kapar, Manjung, and Pontian while the other three is in Sarawak and Sabah which located at Sejingkat, Mukah and Lahad Datu. Since human understood that burning coal generate electricity ,coal combustion such fly ash and

bottom ash can be considered as waste material that has been around and disposed. Coal ash becomes an environmental issue and needs to be reused effectively.

The coal combustion produces large volumes of fly ash and bottom ash. According to Huang (1990), basically 10% of the total weight of coal burner produces coal combustion by-product. Bottom ash, on the other hand, has an angular shape and a rough, gritty surface texture with size ranges from gravel to fine sand based on Kim et al. (2005). Since bottom ash is a raw material and has similarity with sand and aggregate, it is suitable to be used in construction to replace non-renewable materials. An effective utilization of bottom ash in construction material will decrease the accumulation of by-product in landfills as well as reduce environmental pollution.

Soft clay, in particular soft soil, is found in many areas around the world as well as in Malaysia. This unstable ground according to Brand et al. (1981) is geologically young and under stable conditions due to its own weight has not yet undergone significant secondary consolidation by its formation. Generally, soft soil has low shear strength and cannot bear a high imposed load by itself. Mostly the problem of soft soil is related to stability and settlement. Thus, there are some methods to improve its properties and modify the technique such as sand drain, stone column and piling. Although, there are many methods, but it is costly and uneconomical for large projects. Since all methods are using non-renewable materials, bottom ash which has the same characteristics as granular materials can be used and offer an alternative to reduce the disposal cost and conservation of natural soils and land.

As Malaysians, we need to take up the challenge for the use of green and recycled by-product in order to decrease the usage of non-renewable materials as well as a method for transforming the status of 'by-product' to more recently 'product' that are sought for construction and other materials.

1.2 Problem Statement

Soft clay, in particular soft soil, are found in many areas around the world as well as in Malaysia. Soft clay is a soil which has a low shear strength and generally cannot bear a high imposed load by itself. According to Huat (1969), he reported that clay deposits in coastal area of Peninsular Malaysia is between 5 to 30m. Therefore, structure such as bridge, building, dams and highway may not suitable to be construct in this area due to lack of bearing capacity of existing soil. The construction on soft soil is increasing due to lack of suitable land for infrastructures and other developments. Imported soils from cutting of hills and highlands are used for various construction purposes. Thus, soil improvement need to be done on soft soil area.

Soil improvement is a method to increase the bearing capacity and properties of the soil. There are so many method to improve its properties and modify the technique such as sand drill, stone column and pilling. Challenges are faced by geotechnical engineers if the site has soft soil and the problem may occur related to the settlement and stability. However, the usage of non-renewable materials is slightly high in cost. In order to demonstrate effort in protecting the environment against negative impact derive from human activities, we need to emphasis on sustainability.

Bottom ash is a waste material from coal fired power plant. When coal is burned, about 80-90% of unburned material is entrained in flue gas and is captured and recovered as fly ash, remaining 10-20% of the ash is dry bottom ash. The resulting coal ash generated is deposited either in landfill over a vast area of land which is not possible in urban areas or deposited in an ash pond which also has its shortcomings. Tanjung Bin power station produce 180 tonnes per day of bottom ash and 1,620 tonnes per day of fly ash from 18,000 tonnes per day of coal burning alone based on Muhardi et al. (2010).