CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Soil can be branched into four primitive types: gravel, sand, clay and silt. Soil generally has low tensile and shear strength and its characteristics highly depend on the environment conditions. Hence, it requires certain reinforcement to enhance the fundamental properties for construction purpose of the soil. Generally there are diversified materials can be used for soil reinforcement and these are diversified material that can be used for soil reinforcement and these materials are divided into three main types: natural, fabricated and by–products. Therefore, soil improvement is interpreted as a technique to improve the engineering properties of soil by cooperating certain materials with some desired properties which does not consist of or contain least in the soil to evolve the parameters such as shear strength, hydraulic conductivity, compressibility and density.

Soil reinforcement is divided into two categories: systematically reinforced soils and randomly reinforce soils (Akbulut et al., 2007). Systematically reinforced soil can be obtained by organizing continuous reinforcement inclusions within a soil mass in a defined pattern in the form of sheet, strip or bar. In comparison with randomly reinforced soil the discrete fibers are randomly mixed with soil.
Various reinforcement methods feasible for stabilizing soil such as mixing with additives, rewetting, soil replacement, compaction control, moisture control, surcharge loading and thermal method. However, the routines might bring the hindrances from claiming expensive and ineffective. Therefore, new methods are still continuously explored way to enhance strength properties and to decrease the swell behaviors of soil.

Nevertheless, scientific environment research and real field executive of geotechnical engineering utilization had increased attention towards randomly distributed fiber soil composites also known as short fiber soil composite weather in the form of natural or synthetic. The past investigations demonstrate that strength properties of fiber-reinforced soils consisting of randomly distributed fibers are a function of fiber content and fiber-surface friction along with the soil and fiber strength characteristics.

The concept and principle of soil reinforcement was originated in ancient times. During the Mesopotamians and Romans separately identified the way to enhance the capability of pathways to carry traffic. They discovered that stabilizing agents such as pulverized limestone or calcium can be added into weak soil. This mixture will improve the quality of pathways.

About 5000 years ago, ancient civilization found the concept of natural fiber reinforcement such as straw and hay to reinforce mud blocks in order to create reinforced building blocks. In addition, the presence of plant roots can be considered as randomly oriented fiber inclusions in the soil. This natural reinforcement helps to improve the strength of the soils and stability of natural slopes. Several of historic ancient monuments that applied this concept are the Great Wall of China where they used branches of trees as tensile elements and Ziggurats of Babylon, woven marts of read were used. (Hejazi et al., 2011)

In the modern era of soil stabilization, the concept and principle of soil reinforcement was developed by Sir Henri Vidal at 1966, a French engineer who termed it as Terre Armee (reinforced earth). He demonstrated that the introduction of reinforcement elements in a soil mass increases the shear resistance of the medium. More or less 4000 structures have been built in more than 37 countries after the invention of Vidal. One of the examples, traditional brand of “Texsol” introduced polyester filaments before staple fibers that are used in retaining walls and for slope
protection. Likewise, synthetic staple fibers have been utilized within soil since the late 1980’s when initial studies using polymeric fibers were conducted. (Hejaze et al, 2011)

1.2 PROBLEM STATEMENT

Natural disasters happen all over the world including Malaysia itself and they can be utterly devastating for people’s live and the environments in which they live. Malaysia recently was surprised by several natural disasters involving geotechnical problems. Firstly, tunnel landslide at Jalan Imbi, Kuala Lumpur. This disaster happened on July 2014 at 10.38 am at Jalan Imbi, cross Puduraya near Penjara Pudu and again occurred at 12.20 pm. Secondly, slope failure at Mahameru Highway near National Forestry Department for twice on 8 May 2013 at about 6.05 pm and 7 January 2014 at about 5.30 pm. Additionally, the worst case scenario that had happened in Malaysia’s geotechnical arena was the slope failure at Bukit Antarabangsa, Ampang, Selangor. The slope failure occurred on 6 December 2008 and caused fatality rate and deprivation of property whereas exceeding numbers of 20 houses were destroyed. This incident happened due to down poured for a few hours causing and increasing soil saturation and plasticity properties.

Meanwhile, solid waste generation in Malaysia is estimated about 26 million tons in 2007. The composition of municipal solid waste is 30% from the total solid waste generated (Larsen, 2007). Statistics show nearly 50% of the municipal solid waste generated in Malaysia institutional, industry and construction (Saeed, 2009).