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A Review on Soil Stabilization Using Waste Plastic Fiber

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ABSTRACT

From the ages, researchers are trying to find the best and the economical material for the soil stabilization including the waste materials of any kind which could be useful for the purpose. But the research does not end and everyday some new idea is evolved. So, I being a research student when I began to think of some method of stabilization of soil through of using the waste plastic fiber being thrown in the waste by the people. One day when I came to know about the astonishing statistics (online), which are not being recycled (due to health reasons) it is strictly a huge problem to dispose of such a large quality of such type of waste plastic. These are not being used and a huge burden and a big problem for the civil administration as it creates a lot of problem in managing their disposal. So, to convert a nuance into an absolute beneficial use I chose it as a mode of my research for soil stabilization in some different type of manner as it might have been used by some researches in a different way. So, it is the topic of my research "Soil Stabilization Using Waste Plastic Fiber".

1. INTRODUCTION

For any land-based structure, the foundation is very important and has to be strong to support the entire structure. In order for the foundation to be strong, the soil around it plays a very critical role. So, to work with soils, we need to have proper knowledge about their properties and factors which affect their behaviour. The process of soil stabilization helps to achieve the required properties in a soil needed for the construction work.

In India, the modern era of soil stabilization began in early 1970's, with a general shortage of petroleum and aggregates, it became necessary for the engineers to look at means to improve soil other than replacing the poor soil at the building site.

Here, in this project, soil stabilization has been done with the help of randomly distributed plastic fibers obtained from waste materials. The improvement in the shear strength parameters has been stressed upon and comparative studies have been carried out using different methods of shear resistance measurement.

Increased use of plastics in day to day consumer has resulted in the municipal solid waste, an ever-growing fraction of plastic materials which were used for a short time and then discarded. The concept of reinforcing soil masses with strips of plastic cover may be relatively, a new development. In contrast, the use of random-materials as reinforcement for soil is probably not older than written history, but only sparsely represented.

The objective of this project is to analyse the effect of inclusion of plastic fibers in soil on the stability of soil in a cost-effective manner. The four different replacement percentages of plastic fibers (0.25%,0.5%, 1%, 1.5%) will be tested.

2. LITERATURE REVIEW

2.1 Nilo Cesar Consoli (2000):

Unconfined compression tests, splitting tensile tests, and saturated drained triaxial compression tests with local strain measurement were carried out to evaluate the benefit of utilizing randomly distributed obtained from recycling waste plastic fiber combined with rapid hardening Portland cement to improve the engineering behaviour of a uniform fine sand. The separate and the joint effects of fiber content (up to 0.9 wt. %), fiber length (up to 36 mm), cement content (from 0 to 7 wt. %), and initial mean effective stress (20, 60, and 100 KN/m^2) on the deformation and strength characteristics of the soil were investigated using design of experiments and multiple regression analysis. The results show that the polyethylene terephthalate fiber reinforcement improved the peak and ultimate strength of both cemented and uncemented soil and somewhat reduced the brittleness of the cemented sand. In addition, the initial stiffness was not significantly changed by the inclusion of fibers.

2.2 Agus Setyo Muntohar(May 26, 2011)

Although abundant plastic waste contaminating the environment may be utilized as reinforcing materials, a potential pozzolanic material (rice husk ash blended with lime) possesses superior properties in stabilizing soils. Engineering behaviour of the stabilized clayey/silty soil reinforced with randomly distributed discrete plastic waste fibers is investigated in this paper. The results indicate that the proposed method is very effective to improve the engineering properties of the clayey/silt soil in terms of compressive, tensile, and shear strength, which further enhanced the stability and durability of the soil. Based on the compressive strength, California bearing ratio (CBR), shear strength, and failure characteristics, the optimum amount of fiber mixed in soil/lime/rice husk ash mixtures ranges from 0.4–0.8% of the dry mass.

2.3 ChaoshengTang(02.11.2006)

In the present investigation, 12 groups of soil samples were prepared at three different percentages of PP-fiber content (i.e. 0.05%, 0.15% and 0.25% by weight of soil) and two different percentages of cement content (i.e. 5% and 8% by weight of soil), and unconfined compression and direct shear tests were carried out after 7-, 14- and 28-day curing periods. The test results indicated that the inclusion of fiber reinforcement within uncemented and cemented soil caused an increase in the unconfined compressive strength (UCS), shear strength and axial strain at failure, decreased the stiffness and the loss of post-peak strength, and changed the cemented soil's brittle behaviour to a more ductile one. The interactions at the interface between fiber surface and soil matrix were analysed by using scanning electron microscopy (SEM). It is found that the bond strength and friction at the interface seem to be the dominant mechanism controlling the reinforcement benefit. The behaviour at the

interface in fiber-reinforced uncemented soil was different from that in fiber-reinforced cemented soil. The micromechanical properties of fiber/matrix interface were influenced by several factors, e.g. binding materials in soil, normal stress around the fiber body, effective contact area of the interface and fiber surface roughness, etc.

3. CONCLUSION

From the above discussions it can be concluded that there is a dire need to utilize the waste plastic Fiber collect from various sources the waste all over the counter for the stabilization of soil which will help to the most extent to decrease the requirement of valuable land for their disposal and also reduce the hazardous environmental impacts.

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