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Stabilization of Soil by Waste Plastic : A Review

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ABSTRACT

Soil stabilization a general term for any physical, chemical, mechanical, biological or combined method of changing a natural soil to meet an engineering purpose. It include increasing bearing capabilities, tensile strength, resistence from erosion, cutting and sliding also decreases .

Some commonly used stabilzers are cement fly ash, lime fly ash (separately, or with cement or lime), bitumen, tar, cement kiln dust (CKD), tree resin and ionic stabilizers. Other on-site materials including sub-soils, sands, mining waste, natural stone industry waste and crushed construction waste to provide stable, dust free local roads for complete dust control and soil stabilization.

This new technique of soil stabilization can be effectively used to meet the modern challenges of the society and at the same time reduce the quantities of waste, producing useful stabilization from plastic waste. Use of plastic products (such as polythene bags, bottles etc.), is increasing many folds leading to various environmental concerns. Therefore, their disposal without causing any ecological hazards has become a real challenge. Thus, using plastic as soil stabilizer is an solution for the bad quality soil.

INTRODUCTION

For any structure, the foundation is the most important aspect and has to be strong enough to support the entire structure. In the same way for the foundation to be strong, the soil around it plays a major role. For good construction work, the necessity of enhancing soil properties has come to the light. Ancient civilizations utilized various methods to improve soil strength etc., many of these methods were so effective that their structures still exist.

In recent times, with the increase in technique and demand for infrastructure, soil stabilization has started to take a new forms. With the availability of better additives replacement of material is emerging as a popular and costeffective method for soil improvement. The increase in shear strength can be found out by using California bearing ratio test results.

Plastic pollution can afflict all form of lives. It is estimated that 1.1 to 8.8 million tonnes of plastic waste enters the ocean from coastal communities each year. From the data, about 380 million tonnes of plastic is produced worldwide each year.

From the 1950s up to 2018, an estimated 6.3 billion tonnes of plastic has been produced worldwide, of which an estimated 9% has been recycled and another 12% has been incinerated. Through reducing plastic consumption, litter cleanup, and promoting plastic recycling the big disaster can be escaped.

ADVANTAGES

The following are the advantages over the other means -

- Improves the soil bearing capacity by increasing the strength of the soil.
- Economical both in terms of cost and energy to increase the bearing.
- Eliminate deep foundation or raft foundation.
- Prevent soil erosion.
- Stabilized roads/bases are much stronger than conventional granular sub base. Thus, you can reduce the asphalt thickness by 50%, and concrete thickness by 30%.
- It reduces greenhouse gases emissions.
- Reduce the amount of waste that goes to the landfills, and recycling one ton of plastic can save 7.4 cubic yards of landfill space.
- It is a Non-destructive and effective method, at improving load bearing capacity of weak or loose soil strata.

LITERATURE REVIEW

Many researches has been done in this field. Here we summarized some of them. The literature review of the work done by the various researchers are presented below:

Mousa F. Attom , Munjed M. Al-Sharif (2003) carried out the experiments on Soil stabilization with burned **olive** waste. The conclusion, they found in their results is the addition of burned olive waste will **reduce** the **plasticity** of soil, especially when it has a high plastic index.

Mustafa Aytekin and Evin Nas(1998) did the investigation on **red, yellow** and **brown** soil. They conducted the studies on stabilization of soil with lime and cement and found that **lime** is a agent which can **increase** the **shear strength** of the soil but if it is added more than 30%, it decreases the compressibility of the soil.

T. D. V. Lakshmi, Dr. M Anjan Kumar, Dr. DSV Prasad, Dr. GVR Prasada Raju(2015) carried out the experiments on stabilization of industrial waste **red mud** with **cement**. Red mud is a fine grained Industrial waste with high specific gravity(2.9) and high percentages of reactive oxides (SiO2, Al2O3and Fe2O3) as 80%.Addition of cement to Red mud **increases OMC** values and **decreases MDD** values.

Aminaton Marto, Nima Latifi, Houman Sohaei(2013) carried out the experiments on the stabilization of **laterite** soil using **GKS soil stabilizer**. GKS is a new liquid soil stabilizer. The results shows that the GKS is a suitable stabilizer for some of the practical project generally undertaken such as in **increasing** the **road bearing capacity**.

Jurate Kumpiene, Anders Lagerkvist, Christian Maurice(2005) carried out the experiments on Stabilization of **Pb** and **Cu** contaminated soil using **coal fly ash** and **peat**. They found the conclusion that soil amendment with coal fly ash and peat **reduced** the **leaching** of Cu and Pb from contaminated soil by an average of **96%** and **99.9%** in laboratory batch experiments.

Tuncer B. Edil, Hector A. Acosta and Craig H. Benson(2006) carried out experiments on the stabilization of **soft fine grained soils** with **fly ash**. After these experiments they found that **CBR** of soil–fly ash mixtures generally **increases** with fly ash content and **decreases** with **increasing compaction water content**.

Khelifa Harichane, Mohamed Ghrici, Said Kenai, Khaled Grine(2011) used natural **pozzolana** and **Lime** for stabilization of **cohesive soils**. They observed the results as the **plasticity index decreased** with **increasing lime contents**. The **maximum dry density** of **lime stabilized soils decrease with increasing lime** content, in comparison with natural pozzolana stabilized soils.

Megnath Neopaney, Ugyen, Kezang Wangchuk, Sherub Tenzin(2012) used various waste materials like **plastic** mixed with soil and carried out CBR test and found the conclusion that The **maximum improvement in CBR** is obtained while using **0.5% plastics strips**. The maximum CBR value of a reinforced system is approximately 1.70 times that of an unreinforced system.

FUTURE SCOPE

Several researches are done in the stabilization of soil by various stabilizing agents. Studies are still going on in this field to improve the shear strength of soil. In future, the work can be extended in this field by using waste plastic materials. Because of its very slow decompositio rate and also pollute the environment if it is not decomposed. Using it in the stabilization of soil, we can achieve two goals, first that we can improve the quality of soil and the second is we can reduce its harmful effects on the environment.

CONCLUSION

After reviewing the above research papers, we found that lime, cement, bitumen are the stabilizing agents which can reduce the plasticity index of the soil. These methods of stabilizing the soil can be used in the variety of the civil engineering applications. By using plastic wastes, it seems to be an economical method because there is a lack of good quality soil for embankment fills. Yearly, the waste plastic are generated in the mass level and occupied a great space also. So it is necessary to find the solution of this problem. Future work can be extended further in this field.

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