Stabilization of soil of Indian origin

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Abstract- Scrap tires are being produced and accumulated in large volumes causing an increasing threat to the environment. In order to eliminate the negative effect of these depositions and in terms of sustainable development there is great interest in the recycling of these non hazardous solid wastes. The potential of using rubber from worn tires in many civil engineering works have been studied for more than 20 years. Tire wastes can be used light weight material either in the form of powder, chips, shredded and as a whole. Applications of tire rubber proven to be effective in protecting the environment and conserving natural resources. They are used above and below ground water. Many work regarding the use of scrap tires in geotechnical application have been done especially as embankment materials (Ghani et al, 2002) The reuse application for tire is how the tire are processing basically includes shredding, removing of metal reinforcing and further shredding until the desired materials are achieved. A passenger car tire contains approximately 26% carbon black, 47% natural rubber, 30% of synthetic rubber. India is fabricating one lakh metric ton of recycle rubber which is sold@ Rs 70 per Kg.

Index Terms- Scrap, Sustainable, embankment, Shredded

I. Introduction

This paper deals with stabilization of soil using tire chips of different size. Stabilization is the method employed for modifying the properties of soil to improve the civil engineering performance. The main objective is to increase the strength and to reduce the construction cost by using locally available materials such as municipal wastes scrap tire is one of them. how much wastes scrap tires is produced in India is not known but 40 million vehicles are added in last two years Scrap tires can be used in many ways either as a whole or halved or shredded They can be used alone ,embedded or mixed with soil. Shredded tires used in Geotechnical engineering include embankment fill, retaining wall and bridge abutment backfill insulation to frost, vibration damping layers and drainage layers (Edil&Bosscher 1992). We know that accumulation and disposition both resulted into pollution. Leaching from scrap tires produce toxin and cannot be used under ground water.

Soil selected of Indian origins is Laterite soil, sandy soil and black cotton soil found central, northern and eastern part of India.

II. Materials used for studiEs

Bernal *et al.* (1996) reported; It has been found that the use of tire shreds and rubber-sand (with a tire shred to mix ratio of about 40%) in highway construction offers technical, economic, and environmental benefits. settlements, good drainage (avoiding the development of pore water pressure dunng loading), and usage of large quantities of local waste tires, which would have a positive impact on the environment .Akbulut *et al.* (2007) investigated modification of clayey soils using scrap tire rubber and synthetic fibers. This result showed that the unreinforced and reinforced sample was subjected to unconfined compression, shear box, and resonant frequency tests to determine their strength and dynamic properties. These waste fibers improve the strength properties and dynamic behavior of clayey soils. The scrap tire rubber, polyethylene, and Polypropylene fibers can be successfully used as reinforcement materials for the modification of clayey soils.

ENGINEERING PTOPERTIES OF TIRE WASTES

Specific gravity of shredded tires ranges from 1.02 to 1.36. The specific gravity of soils ranges from 2.6 to 2.8. The unit weight of different types of compacted tire shreds as reported in literature range from 2.4 to 7KN/m3 (Humphrey and Menion 1992) these values are .1 to .4 times the unit weight of soil.

The effect of the compaction energy of the unit weight of tire shred and soil mixture is only with tire shred content is less than 25% .Tire chips are generally uniformly graded with specific gravity ranging from 1.02 to 1.27 specific weight of soil is just double than the tire chips.

The hydraulic conductivities of the mixture depend highly on % of soil –chip mix (Geosyntec construction 1998).

Shear strength increases as the tire chips size decreases and as the chip content increases shear strength of the mix increases.

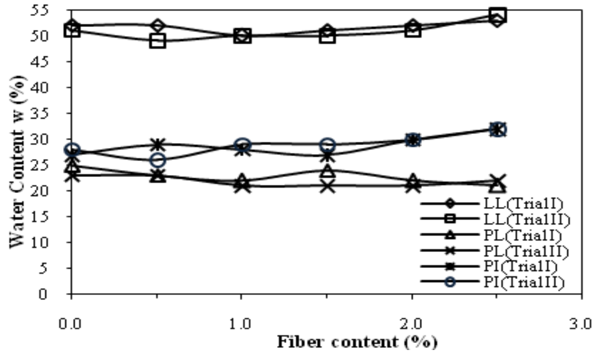


Figure 1: vibration of consistency limit

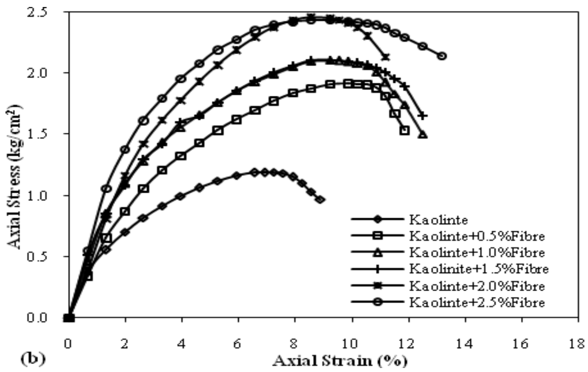


Figure: 2 unconfined test sand

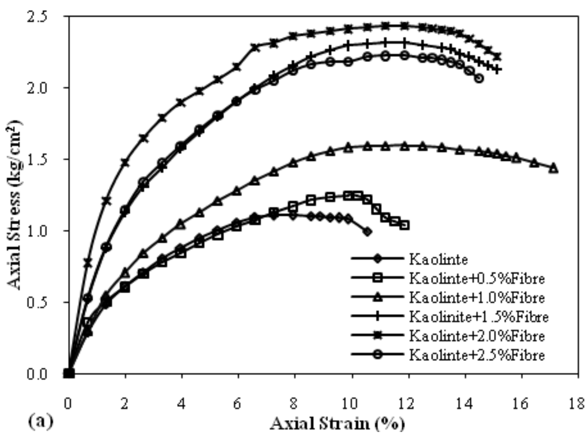
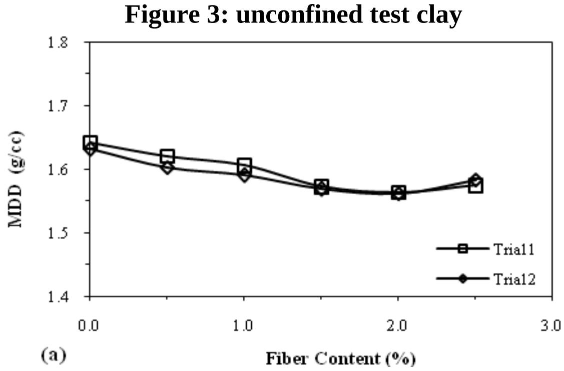


Figure 3: unconfined test clay



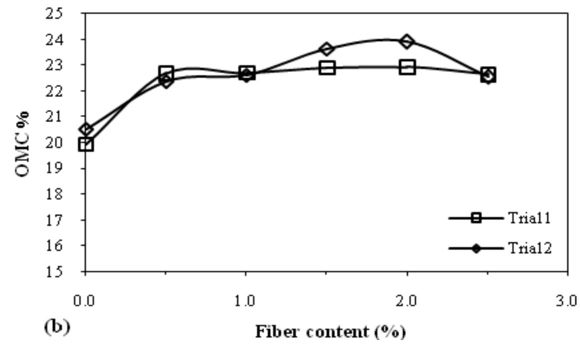


Figure 4: compaction characteristics (a,b)

Table 1

% of tire chip	Average UCS (kg/cm^2)	Peak Axial Strain (%)	Avg. Cohesion, c (kg/cm^2)	Increase in Strength (%)
0.0	1.175	7.461	0.59	NA
0.5	1.589	9.875	0.79	34.83
1.0	1.765	10.091	0.89	50.35
1.5	2.087	9.872	1.05	77.55
2.0	2.354	9.650	1.18	99.79
2.5	2.230	11.181	1.12	89.45

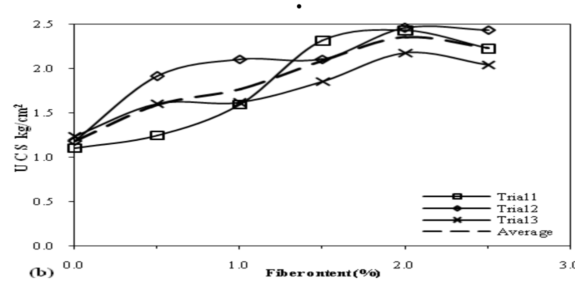


Figure 5: unconfined test mixed with tire chips

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