Research Paper Engineering

Comparative Study on Soil Stabilization by Utilizing Lime and Shredded Rubber Tire

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ABSTRACT

Shredded rubber ties are causing major environmental effects; its utilization for some constructive cause will be a breakthrough in order to prevent the disastrous effects of shredded rubbers. These shredded rubbers can be reused for soil stabilization to develop the strength of the soil. Construction of structure on weak soil is considered unsafe. Improvement of load bearing capacity of the soil may be undertaken by a variety of ground improvement techniques. Since the black cotton soil is extremely weak in strength and highly expansive and contractive in nature. And lime which is in enormous quantum is available in Hyderabad Karnataka area where authors belong to. And it is very problematic for civil Engineers to construct structures over B C Soil. In this study shredded rubber and lime with varying of 1%, 2%, 3%, and 4% (rubber) and 1%, 2%, 3%, and 4% (lime) are used. Usage of shredded rubber tire and lime helps in geotechnical engineering for enhancing the soil properties. In this present investigation behavior of pavement subgrade is improved by soil stabilization with shredded rubber tire and lime. It is found that the maximum value of CBR is got at 3% in shredded rubber and 2% in lime. This study shows that rubber is good material for increasing the soil strength for sub-grade. The low and high strength compressible soft soil was found to get improved by addition of shredded rubber tire and lime.

KEYWORDS : Soil Stabilization, Black Cotton Soil, OMC & MDD, shredded rubber tire, Lime and California bearing ratio test

INTRODUCTION

The soil often is weak and has no enough stability in heavy loading. The aim of the study was to use the waste material for stabilization of soil in order to reduce the environmental impact. Several reinforcement methods are available for stabilizing soils. Scrap Tire generations is always on the increasing trend everywhere in the world. Majority of them end up in the already congested landfill or becoming mosquito breeding places. Worst when they are burned. This paper aims at studying the appropriateness of shredded rubber Tires for its use in pavement engineering, i.e. to stabilize the subgrade of the pavements. It discusses about CBR value of soil-Tire mixture and the results are presented. Improving an onsite soil's engineering properties is called soil stabilization. Soils containing significant levels of silt or clay, have changing geotechnical engineering characteristics. Once they have been treated with lime, such soil can be used to create embankments or subgrade of structures, thus avoiding expensive excavation works and transport. Use of lime significantly changes the characteristics of a soil to produce long term permanent strength and stability, particularly with respect to the action of water and frost. The program of standard proctor test, UC test, CBR test, was carried on the cohesive soil specimen by varying the tire chips content from 5 % to 20% by weight soil. The result shows that 13% & 30% chips Content respectively by weight where optimum for composite strength of the two reinforced soil mixture[1] it is concluded that the waste rubber tire is a good earth reinforcement material and which reinforcement can be substituted for deep and raft foundation to save cost[10]the UCS value increased with increase in % of crumb rubber and the maximum value where observed at 10% & 15% for the sample[6]

MATERIALS USED

The soil used in this study collected from Kumasi village, Kalaburagi District, Karnataka, India. Classification of soil as per BIS is CI which is clay with intermediate compressibility. Added amount of lime had been varied in proportions of 1%, 2%, 3% and 4%. The view of lime used in the study is shown in Fig.1 and Fig.2. The shredded rubber tire having sizes ranges from 5 to 20mm(Length) and 2 to 3mm (Thick) and the steel belting was removed are used extensively. Added amount of rubber tire had been varied in proportions of 1%, 2%, 3% and 4%. Below fig shows

Fig 1. Lime

Fig 2. Lime mixed with soil

3. CBR VALUE OF SOIL-TIRE CHIPS AND LIME

CBR tests were conducted on soil and soil -lime mixtures to determine the CBR value from which the suitability of soil stabilized with lime can be assessed. In addition to that the thickness of the pavement can also be determined from the CBR value. The tests were conducted a corresponding water is added by OMC and MDD of the soil, soil -lime mixtures. The soil is mixed with lime of 1%, 2%, 3% and 4% by weight of soil and standard proctor test were conducted on soil-lime mixtures. The CBR values of the soil and soil-lime mixtures are summarized in the respective tables. The variation of CBR value with percentage of lime is shown in Fig. 3and Fig.4.CBR value of Plains soil 1) Unsoked=4.48% 2)Soked=1.24%

Fig 3. Shredded rubber tire

Fig 4. shredded rubber tire mixed with black cotton soil

Table 3.1: CBR value of Soil-lime mixture Unsoaked

Limecontent %	Curing period Of 3days	Curing period of 7 days
0	4.14	4.8
1	6.31	7.1
2	9.66	10.25
3	6.50	7.49
4	5.76	6.7

FIG 3.1:- Variation of lime percentage on California bearing ratio (unsoaked) of black cotton soil for curing period of 3 and 7 days

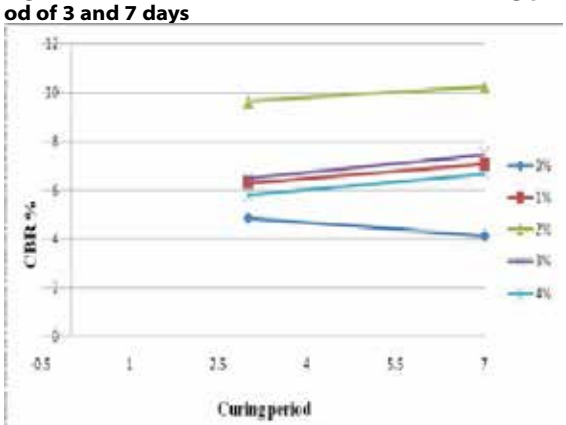

Table 3.2: CBR value of Soil-lime mixture soaked

Lime content(%)	Curing period Of 3days	Curing period of 7 days
0	1.11	1.27
1	1.59	1.65
2	1.83	2.38
3	1.64	2.15
4	1.35	1.93

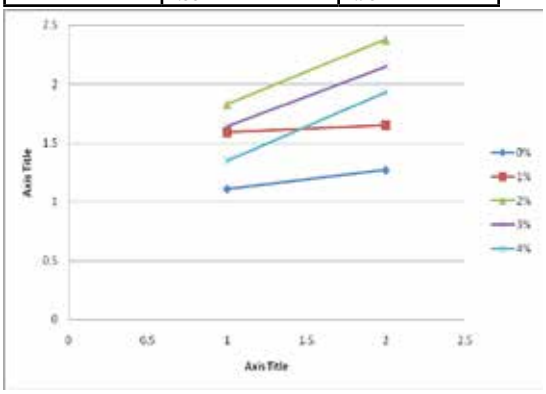

Fig 3.2:- Variation of California bearing ratio (soaked) for curing period of 3 and 7 days on black soil with lime.

Table 3.3 CBR value of Soil-Tire mixture UNSOAKED

Shredded tire chips %	Curing Period of 3days	Curing Period Of 7 days
0	9.66	10.25
1	10.03	12.03
2	11.66	13.97
3	12.98	15.89
4	9.88	11.43

Table 3.4 CBR value of soil and tire mixture soaked

Shredded tire chips %	Curing period of 3days	Curing period of 7 days
0	2.1	2.69
1	2.75	4.64
2	2.97	4.99
3	2.55	4.44
4	2.2	3.24

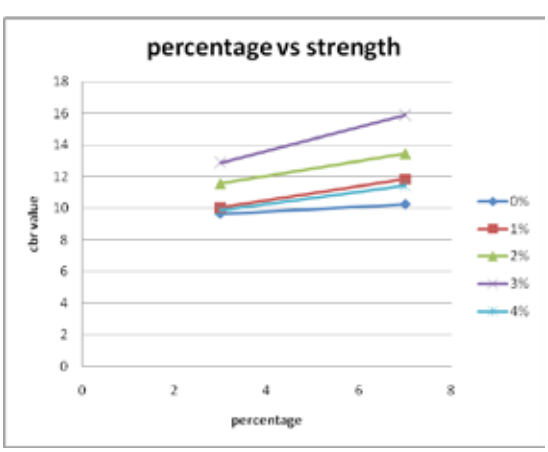

Fig 3.4 Variation of CBR soaked for curing period of 3 and 7 das on black cotton soil with shredded tires.

4 CONCLUSIONS:

Based on the experiments carried out on soil and soil-Tire mixtures, the following observations and conclusions are drawn:

The optimum moisture content as well as maximum dry density is found to decrease with the increase of the percentage of rubber Tire content. This might be due to light weight nature of Tire waste.

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Shredded rubber Tire mixed with soil showed enhancement in CBR value with adding up to 3 % and there beyond decreased with additional increment in Tire content in unsoaked condition. Hence the optimal value of shredded rubber Tire is 3 %.

The California bearing ratio increases with the increase in shredded Tire chips content at an optimum fiber content of 3%.

Deep foundations and raft foundations for structures on soil with low bearing capacity can be replaced by shallow foundation with soil stabilized by shredded rubber waste. Shredded rubber fiber can be considered as a good reinforcement material.

The optimum moisture content as well as maximum dry density is found to decrease with the increase of the percentage of lime content.

Lime mixed with soil showed enhancement in CBR value with adding up to 2 % and add more amount of lime to get more strength.

Deep foundations and raft foundations for structures on soil with low bearing capacity can be replaced by shallow foundation with soil stabilized by lime considered as a good binding mater

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