

Utilization of Shredded Rubber Tire in Soil Stabilization



Engineering

KEYWORDS : Soil Stabilization, Black Cotton Soil, Sub grade, Shredded Rubber Tire and California bearing test.

Tanveer asif zerdi

Director, Professor and HOD civil Engineering Dept. K.C.T.E.C, C/o Dr. Meenaz Maternity Hospital, H No.5-408/40/1&2, Near KBN Inst of Medical sciences, Madeena colony, Kalaburagi. Karnataka. India.

Pallavi

U.G Student Dept. of Civil Engineering, V.T.U. K.C.T.E.C, Kalaburagi, Karnataka

Siddappa

U.G Student Dept. of Civil Engineering, V.T.U. K.C.T.E.C, Kalaburagi, Karnataka

Pranesh

U.G Student Dept. of Civil Engineering, V.T.U. K.C.T.E.C, Kalaburagi, Karnataka

ABSTRACT

Weak or soft soil is considered unsafe for construction of engineering structure. To bring about improvement in such soil, ground improvement techniques are utilized commonly in these days. In which the to take up the expected forces coming on the ground soil is made suitably capable by altering natural state of the soil. In this present study, waste shredded rubber has been chosen as the reinforcing material for soil improvement. The growing market of recycled tire to be used in construction of pavement sub grade gives is a positive approach. Use of tire chips has an advantage of being availability after the use of scrap tires which is a waste material. Shredded rubber tire having sizes ranges from 5mm to 20mm (Length) and 2mm 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%. Use of shredded rubber tires in geotechnical engineering for enhancing the soil properties has received great attention in the recent times. This paper presents the investigation of behavior of pavement sub grade soil stabilized with shredded rubber tire. It is found that at 3% of tire content utilised in the soil for stabilization purpose gives the maximum strength.

1.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. stabilize the sub grade of the pavements. It discusses about CBR value of soil-tire mixture and the results are presented. Test result shows that the maximum load carrying capacity associated with less value of rebound deflection is obtained for gravel/fly ash reinforced sub-base compared to unreinforced sub-base¹ the analysis include the comparison of clayey soil after stabilizing with the available soil parameter and property such as compaction test, arbiters limit test, linear shrinkage test and swelling test by replacing 30%. The combination has been used of 70 % soil + 30 % stabilizing agent² The standard compaction test where conducted in laboratory for obtaining MDD & OMC corresponding to 5% of micro silica fume mixed with expansive soil by varying 5% each, for this CBR test where conducted with the above proportion CBR value of expansive soil blended 10% silica fume increased from 2.69 to 5.87 i.e., 108.85% similarly for unsoaked CBR value increased from 7.45 to 15.56 i.e., 118.21 %³

2. 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. Shredded rubber tire was cut into different sizes ranges from 2mm to 3mm in Thick and 5mm to 20mm in Length. Added amount of rubber tire had been varied in proportions of 1%, 2%, 3% and 4%. The view of shredded rubber tire used in the study is shown in Fig.1 and Fig.2.

Fig. 1: Shredded rubber tire



Fig.2: Shredded rubber tire with Black Cotton Soil



3. CBR VALUE OF SOIL-TIRECHIPS

CBR tests were conducted on soil and soil-shredded rubber tire mixtures to determine the CBR value from which the suitability of soil stabilized with shredded tires 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-tire mixtures. The soil is mixed with tire shreds of 1%, 2%, 3% and 4% by weight of soil and standard proctor test were conducted on soil-shredded rubber tire mixtures. The CBR values of the soil

and soil-tire mixtures are summarized in the respective tables. The variation of CBR value with percentage of tire is shown in Fig. 3 and Fig.4.

CBR value of Plain soil : 1) Unsoaked= 4.48% 2) Soaked=1.24%

Fig 3.1 Variation of California Bearing ratio (unsoaked) for curing period of 3 and 7 days on black cotton soil with shredded rubber tire

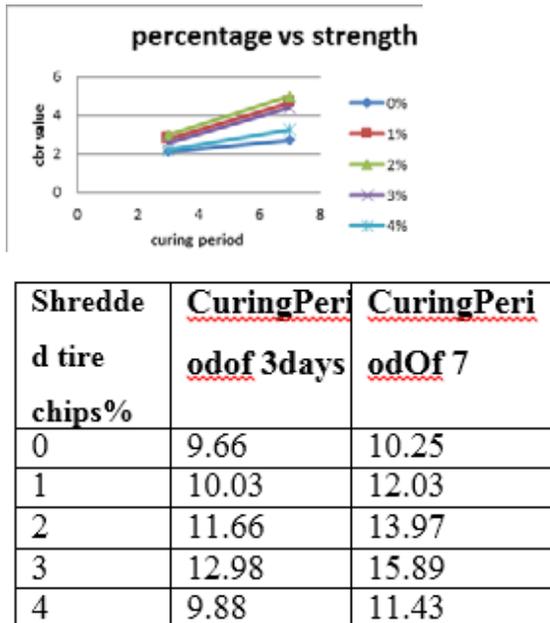


Table 3.1 CBR value of Soil-Tire mixture UNSOAKED

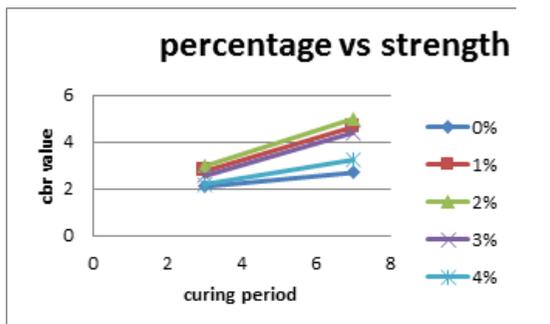


Fig 3.2 Variation of California Bearing ratio (soaked) for curing period of 3 and 7 days on black cotton soil with shredded rubber tire

Table 3.2: CBR value of Soil-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

The respective CBR values are shown in the tabular columns which are self explanatory. The peak and highest value which is there at 3% that is the best proportion which gives soil strength.

4 CONCLUSIONS:

- Based on the experiments carried out on soil and soil-Tire mixtures, the following observations and conclusions are drawn
1. The optimum moisture content as well as maximum dry density of rubber. Tire content. This might be due to light weight nature of Tire waste.
 2. 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 %.
 3. The California bearing ratio increases with the increase in shredded Tire chips content at an optimum fiber content of 3%.
 4. 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.

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