International Journal of Civil Engineering and Technology (IJCIET)
Volume 7, Issue 4, July-August 2016, pp. 549–552 Article ID: IJCIET_07_04_052
Available online at http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=7&IType=4
ISSN Print: 0976-6308 and ISSN Online: 0976-6316

IMPROVEMENT OF SOIL STABILITY USING SHREDDED TYRE

Dharamvir
M.E. Student, Department of Civil Engineering,
Chandigarh University, Gharuan, Mohali.

Puneet Sharma
Assistant Professor, Department of Civil Engineering,
Chandigarh University, Gharuan, Mohali.

ABSTRACT

This paper regards to modify the strength characteristics of clayey soil using shredded pieces of tyre. Randomly distributed shredded tyres maintain strength isotropy and chances of development of potential plane of weakness are reduced.

The engineering behaviour of soil tyre mixture has been determined by conducting the tests such as Standard Proctor test and California Bearing Ratio test. The tests have been conducted of virgin soil as well as on soil mixed with tyre pieces amounting to 5, 10and 15% of weight of dry soil. The results indicate that improvement in strength of soil can be obtained using shredded tyres as reinforcing material. The potential use of soil tyre mixture as light weight material is also discussed.

Key words: Shredded Tyre, Soil Tability, reinforced soil, reinforced earth

Cite this Article Dharamvir and Puneet Sharma, Improvement of Soil Stability using Shredded Tyre. *International Journal of Civil Engineering and Technology*, 7(4), 2016, pp.549–552.
http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=7&IType=4

1. INTRODUCTION

Soil is abundantly available naturally occurring material in this universe. It is the cheapest available construction material. But at the same time, it is very complex material also. The behaviour of the soil varies with naturally occurring conditions.

The main engineering properties of soil with which the soil engineer is concerned are the volume stability, strength, permeability and durability.

The modern concept of reinforced earth was developed in early 1960's. Reinforced earth const. gained recognition in various countries such as Japan, UK and USA besides France since early 1970's. The federal Highway Administration approved the reinforced earth method for highway construction as an alternate to other method for resisting forces.

It is estimated that 1-2 billion scrap tyres have been disposed in huge piles across United States. Some of the current uses for recycled tyres include fuel for energy generation, highway barriers, reefs and crumb rubberpavement.

One possible application consists of using shredded tyres alone or mixed with soil as fills and backfills which require the mechanical properties of such and their response under realistic loading be studied.

In the present work, an attempt has been made to assess the performance of shredded tyre reinforced soil by various laboratory tests, such as Proctor Compaction tests and California Bearing Ratio test.

Before use of tyres shreds/chips in engineering projects, it is also important to consider any possible environment implications. Such implications include potential ground water contamination and in situ spontaneous combustion of the tyre chips or shreds but our main aim is to focus on the engineering behaviours of shredded tyres.

2. NEED OF STUDY

In this fast developing world it seems impossible to impose restriction on the design requirements. The very purpose of the structure to be built of such soil is not served. Secondly it is uneconomical to remove the material at site when huge quantities are involved. Rather it is difficult to find the superior material when required in quantities .so replacement of site material is only limited to when quantities involved are not much. Sometimes the feasibilities of the whole project involving the huge amount of soil fill becomes jeopardized because of uneconomical import of soil from other sources.

So we are left with third alternative of improving the engineering behaviour of the available soil. Altering the properties of the soil for meeting the designed requirements.

3. LITERATURE REVIEW

Unlike continuous oriented inclusion commonly used in reinforced earth structure, limited information has been reported in literature of reinforced soil using shredded tyre.

Sompote Youwai in 1992 performed triaxial tests of compacted shredded rubber tyre sand mixtures. The tests were carried out with different mixing ratios of shredded rubber tyres and sands. With an increasing proportion of sand in the mixture, the density, unit weight and shear strength of the mixture increased but the compressibility decreased. The dialatancy characteristics of shredded rubber tyres mixed sand were relatively similar to cohesion less material

4. SURVEY AND DATA COLLECTION

In case of Proctor Compaction test, the soil sample is taken after compaction in the mould and its water content and dry density is determined. Now the next step is to reinforce the soil with shredded pieces of tyre and conducting the proctor test on it. The soil was reinforced with shredded pieces of tyre with amount varying as 0.5, 10, 15% of weight of soil and hence values of dry density obtained corresponding to different values of water content.

In CBR test, the load is applied over the soil in mould so that penetration rate is 1.25mm/minute, then the load is recorded at the penetration of 2.5, 5.0 and 7.5.

After that the test is repeated on reinforced earth.

Finally the load penetration curve is drawn with load as ordinate and penetration as abscissa. From the curve, by application of formula in relation to load and corresponding penetration, we get the CBR value.

4.1. Proctor Compaction Test

Table 1 Dry Density Corresponding to Different Water Contents (0% & 5% S.T)

Water Content (%)	Density (KN/m^3)	
	0% S.T.	**5% S.T.**
10	16.4	16
13	16.9	16.6
15	17.9	17
17	17.5	16.9
20	16.6	15.9

4.2. Proctor Compaction Test

Table 2 Dry Density Corresponding to Different Water Contents (0% & 15% S.T)

Water Content (%)	Density (KN/m^3)	
	10% S.T.	**15% S.T.**
10	14.5	13.6
13	15.6	14.5
15	15.9	14.6
17	15.95	14.9
20	15.35	14.6

4.3. Proctor Compaction Test

Table 3 Value of O.M.C and Maximum Dry Density for different Percentages of S.T

% of S.T.	Size of S.T. (6-10) mm		
	OMC (%)	**Dmax KN/m^3**	**% of change**
0	16.0	18.2	0
5	16.2	17.3	- 4.94
10	15.9	16.0	- 12.09
15	16.2	15.0	- 17.58

5. CONCLUSIONS

- The study shows that as the %age of shredded tyres increases, the MDD of soil tyres mixture decreases.
- Where the weight of the fill is a critical factor, soil tyre mixture can be used as a light weight, highly porous fill with acceptable strength and deformation characteristics**.**
- In Case OF **Proctor Compaction test** it has been observed clearly that the dry density of the soil increases with an increase in the water content. As the water content is increased, the soil particles get lubricated and have closer packing. However with increase in water content beyond optimum water content the air voids do not decrease but the total voids increase and the dry density decrease.
- In Proctor Compaction test there has not been found any considerable variation in the value of O.M.C with the change in amount of reinforcement and it remain more or less close to 16% for all the cases considered but the maximum dry density decreases from value 18.2KN/m^3 to 15.0 KN/ m^3 as we go on increasing the value of reinforcement.
- At 15% Shredded tyres the density decreases by 17.58%. The test result implies that shredded tyres have almost negligible influence on O.M.C and decrease in dry density due to addition of light weight material.

6. FURTHER SCOPE OF WORK

- The influence of shredded tyres on the permeability of the soil can be tested.
- Compressibility of the soil can be tested.
- The effect of soil constituents on the biodegradability of shredded tyres can be investigated.

REFERENCES

[1] Heimdahi, T.C and Drescher, A. (1999): "Elastic anisotropy of tyres shreds", Journal of Geotechnical and Geo environmental Engineering;

[2] Lee, J.H. Salgado, R. Bernal, A. and Lovwel, C.W. (1999): "Shredded tyre and rubber san d as light weight backfill"

[3] Wei, et.al (1997) " Triaxial Determination of shear strength of Tyres Chips"

[4] Ahmed, I. (1993) "Laboratory study on properties of rubber soils" Joint Hwy. Res. Indian Dept. of Transpt. Dept.

[5] D.B. Eme and T.C. Nwofor, Investigating the Marshall Stability Requirements of Asphalt Concrete Mix with Ground Scrap Tyres as Aggregate. *International Journal of Civil Engineering and Technology*, 6(9), 2015, pp.01-07

[6] Benda, C.C (1995) "Engineering properties of scrap tyres used in geotechnical applications" Rep. 95-1 Mat. And Res. Div.

[7] Bishop A.W and Henkel, D.J (1957) " The measurement of soil properties in the triaxial test"

[8] Eaton, R.A. Roberts, R.J. and Humphrey. D.N. (1994) " Gravel road test section insulated with scrap tyres chips"

[9] Nagendra Prasad.K, Manohara Reddy.R, Chandra.B and Harsha Vardhan Reddy.M, Compression Behaviour of Natural Soils. *International Journal of Civil Engineering and Technology*, 4(3), 2013, pp.80-91.