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A REVIEW PAPER ON

SOIL STABILIZATION USING LIME AND TYRE SCRAP

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ABSTRACT

In India, discarded or discarded tires are produced and collected in large quantities that pose a growing environmental risk. In order to eliminate the negative impact of these approaches and on sustainable development, there is great interest in the recycling of this solid non-hazardous waste. So, we can stabilize the soil by using lime and rubber tire rubbish, which is available in bulk. The purpose of this study was to improve the ability to transport clay soil using dirty tires and lime. Testing the soil moisture content of the soil using lime and dirty tire rubber and researching the improvement of the soil stability of the clay using lime and dirty rubber tires.

KEYWORDS

Waste tyre rubber, sustainable development, stabilization of soil, clay soil, lime.

INTRODUCTION

Soil stabilization is a way to improve soil boundaries such as shear strength, density, density, hydraulic operation etc. Ground reinforcement techniques can be divided into many methods such as mixing, direct flow, vibration, overcharging, mixing. , grouting and reinforcement and other methods. Geotechnical engineers around the world are looking for other innovations needed to come up with more cost-effective solutions for land reform and conservation of rare natural resources. With the globalization of the Indian economy and the emphasis on infrastructure development, the number of vehicles on the road is growing day by day. Increased growth without causing noise and air pollution has started to cause pollution in terms of piles of discarded tires. Many countries have already banned the dumping of waste wheels in clean areas. The use of dirty tires like gasoline has now been banned by the Indian Government because of its environmental impact. In this regard, the development of new systems has been the subject of research on the use of eroded rubber to be used in road construction.

OBJECTIVE OF STUDY

The main purpose of soil consolidation is to improve the existing environment in order to build a solid and solid foundation and a basic lesson. Thus, the goal of soil stabilization is to provide a solid foundation. Soil consolidation is used to reduce the penetration and compression of soil masses in land structures and to increase its shear strength. Soil consolidation is required to increase the carrying capacity of the soil base.

MATERIAL USED

SOIL

In this study, clayey subgrade soil is used. The clay soil found in the area was collected in the fields of the Shahabad district of Kurukshetra at a depth of 0.7m below the ground using a disturbed sampling method and carefully filtered by hand to eliminate plant and stone issues.

LIME

In soil stabilization lime is added to active soil to produce long-term energy through a pozzolanic reaction. This reaction produces stable calcium silicate hydrates and calcium aluminate hydrates as calcium from lime reacts with aluminium and molten silicates. The full-time pozzolanic reaction can persist for a very long time, even decades - as long as adequate lime is present and the pH remains high (over 10). As a result, lime treatment can produce long-lasting energy gains. The key to pozzolanic remodelling and stabilizing active soil, good hybrid design protocol, and reliable construction processes.

TYRE SCRAP

To improve the engineering structures of the clay, tyre scrap was selected as an additive. Tyre Scrap rubber is a commonly used term for recycled rubber from car and truck tires. During recycling the metal and fluff are removed leaving the rubber with granular consistency. Continuous processing of granulator and / or cracker mill, perhaps with the help of mechanical methods, gradually reduces the particle size. Crushed rubber powder, which is used as an additive in current research to obtain desirable engineering structures in the existing problem area.

LITERATURE REVIEW

In the current environmental and economic climate, the pressure is placed on engineers to identify appropriate ways where possible to recycle any waste available in the area to reduce project costs and its impact on the environment. In soil development methods, waste products are also used to improve soil geotechnical structures. Disposal of tire waste is important because it poses a variety of environmental hazards. The benefits of reusing discarded tires are much better when they can be used to replace (full or partial) rare and valuable non-renewable building materials. The soil is usually weak and does not have enough stability for heavy loading. The purpose of the study was to review soil stabilization using less expensive methods. Based on the literature, a cut rubber tire can be used as a light weight either whole wheels, shredded and chips or tin mix with soil. The whole view reveals the need for reinforcement. For the same purpose literature review is being done on the use of solid waste to strengthen the soil and its function.

Baykal et al. (1992) clay mixed with a used tire obtained from the rear industry and hydraulic conductivity test is performed using liquid fuel as it enters. The powder strength of the soil tire decreases when the rubber content exceeds 30% of the mixture because the chip tire mixture behaves differently from the reinforced soil and resembles a fuse chip mass mixed with sand.

Foose (1996) The falling head rigidity test was performed on rubber-mixed soil samples and it was noted that when water was allowed by the samples a small increase in pure water performance was observed.

lee et al. (1999) and determine the shear strength and stress-related relationship of the chip wheel with the mixture of sand and chip chips. They found features of durability and strength of chip shreds and a mixture of rubber sand.

Papp et al (1997) conduct a study of discarded discarded tires connected to the ground beneath a flexible road. The Resilient modulus (Mr) test was used to determine the plastic and elastic strains tests performed on non-compacted soil mixed with a variety of activated tire chips. Combining ratings ranged from 0.1 to 0.5 tire chips to the ground with a dry weight. The performance of a shredded wheel alloys was comparable to that of naturally occurring soil used in the installation of a small foundation in New Jersey. He concluded that mixing the tire chips with the soil does not pose a problem unless the metal wires come out excessively on the chips. The addition of ground tire chips reduces both the density and strength of the soil. The 50mm (1.96 inch) tire chips were very economical and had a very negative impact on power.

Rao and Dutta (2001) do studies on sand mixed with rubber chips. Compressibility testing and triaxial testing were performed. Relationships of stress and energy limits were investigated. It was found that the amount of internal friction and active sand mixing increased with an increase of 15% in rubber.

Ghazavi (2004) investigates the suitability of recycled granular rubber as a lightweight back-up material. You have noticed that the unit weight of the sol has been reduced from about 14Kn to about 8 KN in real 70% rubber compound. Ghazavi concluded that

1. The addition of rubber to the sand did not improve the shear resistance of the compounds.

2. Approximate combinations of approximately 10 KPa were obtained from clusters containing rubber grains.

3. Decreased initial friction angle with an increase in rubber percentage.

4. The unit weight of the compound decreases with the addition of rubber.

Ventappa and Dutta, (2006), conduct research with the aim of determining the density and strength characteristics of sand and wheel alloys to suit sand chip mixtures for integration. They concluded that the density of up to 20% of the sand mixture should be 1% i.e. at a tolerance limit of 10m wall height and produce cohesion between 7-17.5 KPa and the internal friction angle increased from 38 to 40 degrees .

Cabalar, (2011) GTR mixed with sand from two geologic structures, Leighton Buzzard Sand (LBS) and Ceyhan Sand (CS). These sands were chosen because of their unique architectural and engineering properties. LBS is rough with less angular particles, and CS is better with angular particles. The size of the rubber particles was not listed but the particles were described as "empty." Rubber is mixed with each type of sand at 5, 10, 120, and 50% by weight. Each compound was subjected to direct shear testing and found that the shear pressure and internal friction angle of the two compounds decreased by approximately 10% of the rubber concentration and then reduced. He concluded that the mixtures were useful as a lightweight wall complements the weak foundation soil and retains wall backfill material as the sand rubber compounds were much lighter than 100% sand mixtures.

CONCLUSION

- Soil stabilized with rubber crumbs along with lime is more suitable for shallow foundation.
- Cost effective method of stabilization.
- Best solution for the environmental problem.
- New resource for the construction industry.

REFERENCES

[1] Amin, E.R. (2012) “A Review on the Soil Stabilization Using Low-Cost Methods”. Journal of Applied Sciences Research, pp.2193-2196.

[2] Bayka I, G., Yesiller, N. and Koprulu, K, (1992), "Rubber-Clay Liners Against Petroleum Based Contaminants", Environmental Geotechnology, pp 477-481.

[3] Cabalar, A. F. Direct Shear Tests on Waste Tires-Sand Mixtures. Geotechnical and Geological Engineering, Volume 29, Issue 4, 2011, pp. 411-418.

[4] Foose, G.J., Benson, C.H. and Bosscher, P.J., (1996), “Sand Reinforced with Shredded Waste Tires”, Journal of Geotechnical Engineering, 122(9), pp 760-767.

[5] Gary J. Foose, Craig H. Benson and Ralaraddi, P.G. (2014) “ Soil Stabilization using Waste Shredded Rubber Tire Chips”. Journal of Mechanical and Civil Engineering (JMCE), Vol. 1.1, pp.20-27.

[6] Ghazavi, M. Shear Strength Characteristics of Sand-Mixed with Granular Rubber Geotechnical and Geological Engineering, Volume 22, Issue 3, 2004, pp. 401-416 i. .

[7] Humphrey, D. N, and Manion, W. P. (1992). Properties of tire chips for lightweight fill. Proc. Conference on Grouting, Soil Improvement and Geosynthetics, New York, 1344-1355. **[9]** http:// en.wikipedia.org

[8] Humphrey, D.N. and Nickels, W.L. (1997) “Effect of tire chips as lightweight fills on pavement performance”. Proc. 14thInt. Conf. On Soil Mech. and Found. Engg, 3, Balkema, Rotterdam, The Netherlands, pp.1617-1620.

[9] http:// en.wikipedia.org

[10] IS: 2720 (Part 3/Section 1)-1980, (Reaffirmed 2002) “Methods of Test for Soil: Determination of Specific Gravity.” Bureau of Indian Standards. **[11]** IS: 2720 (Part 4)-1985, (Reaffirmed 2006) “Methods of Test for Soil: Grain Size Analysis.” Bureau of Indian Standards.

[11] IS: 2720 (Part 4)-1985, (Reaffirmed 2006) “Methods of Test for Soil: Grain Size Analysis.” Bureau of Indian Standards.

[12] IS: 2720 (Part 5)-1985, (Reaffirmed 2006) "Methods of Test for Soil: Determination of Liquid and Plastic limits." Bureau of Indian Standards.

[13] IS: 2720 (Part 6)-1972, (Reaffirmed 2001) "Methods of Test for Soil: Determination of Shrinkage Factors." Bureau of Indian Standards.

[14] IS: 2720 (Part 7)-1980, (Reaffirmed 2002) "Methods of Test for Soil: Determination of Water Content – Dry density Relation Using Light Compaction." Bureau of Indian Standards.

[15] IS: 2720 (Part 10)-1973, "Methods of Test for Soil: Determination of Unconfined Compressive Strength." Bureau of Indian Standards.

[16] Mandeep Singh., and Anupam Mittal. (2014) "A Review on the Soil Stabilization with Waste Materials". International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 National Conference on Advances in Engineering and Technology, pp.11-16.

[17] Rao G.V and Dutta R.K (2001), "Utilisation of shredded tyres in highway engineering", Proceedings of the International seminar on sustainable development in road transport, New Delhi, pp 257-268.

[18] Tuncer, B. Edil., Jae, K. Park., and Jae, Y. Kim, (2004) "Effectiveness of Scrap Tire Chips as Sportive Drainage Material". Journal of Environmental Engineering, Vol. 130, No. 7, pp.824-831.