International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

COPY RIGHT

ELSEVIER
SSRN

IJIEMR Transactions, online available on 1st Aug 2019. Link :http://www.ijiemr.org/downloads.php?vol=Volume-08&issue=ISSUE-08

Title **MECHANICAL PROPERTIES INVESTIGATION OF EXPENSIVE SOIL WITH FLY ASH AND WASTE PLASTICS**

Volume 08, Issue 08, Pages: 52–56.

Paper Authors

G.LAKSHMANA RAO, V.MANI DEEP

Kakinada Institue of Engineering and Technology - II, Korangi, Kakinada

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

MECHANICAL PROPERTIES INVESTIGATION OF EXPENSIVE SOIL WITH FLY ASH AND WASTE PLASTICS

G.LAKSHMANA RAO[1], V.MANI DEEP[2]

[1]PG Scholar ,Kakinada Institue of Engineering and Technology - II, Korangi, Kakinada

[2]Assistant Professor , Kakinada Institue of Engineering and Technology - II, Korangi, Kakinada

ABSTRACT

The black cotton soils undergo excessive volume changes, making their use in the construction of civil engineering projects very difficult. Swelling soil always create problems more for lightly loaded structures than moderately loaded structures. By consolidating under load and changing volumetrically along with seasonal moisture and unequal settlement. As a result, damage to foundation systems, structural elements and architectural features defeat the purpose for which the structures are erected. The properties of the black cotton soils can be altered in many ways viz. mechanical, thermal and chemical means. Therefore, soil stabilization techniques are necessary to ensure the good stability of soil so that it can successfully sustain the load of the superstructure especially in case of soil which is highly active; also, it saves a lot of time. Attempts to study about such unpredictable behavior through research on how to bring these problems under control form the backdrop for this project work. Therefore, a number of laboratory experiments are conducted to ascertain host of soil engineering properties of a naturally available expansive soil before and after stabilization. Pre-and post-stabilized results are compared to arrive at conclusion that can thwart expansive soil problems. Expansive soil reinforced with synthetic fibers is a modified method developed in recent years. Laboratory studies on soil reinforced with discrete fibers which are useful in restraining the shrinkage tendency of the soil. Test values. In the present work, an attempt has been made to study the compaction, Unconfined Compression Test, California Bearing Ratio(CBR) tests were conducted on black cotton soil mixing with different percentages of fly ash and plastic fibre with a view to determine the optimum percentage.

Intrduction:

Soil stabilization is a technique introduced many years ago with the aim to improve the properties of soil and make it suitable for specific engineering projects. Several additives which are required for ground modification such as cement, lime, and mineral additives such as fly ash, silica fume, rice husk ash have been used under various context. Developing countries like India possess abundantly available agro based resources and by products from industries, many of which are utilized along with a variety of low value products. On the other hand developed countries have

accepted and followed the concept of no waste and all such materials are termed as new resources for new material development through value addition. Soil stabilization signifies the method to improve the load carrying capacity of soil. It also includes the change in properties like increase in stability, change or improvement in density and swelling behaviour, change in chemical properties and water proofing material properties, by means of soil stabilization strength of locally available soil can be improved to desired level. The choice of a particular soil stabilization depends on many factors like type and nature of soil, type and importance of project and economy of the project. When locally available material is mixed in suitable proportion in such a way so as to improve the stability of soil, then such technique of soil stabilization is known as proportioning technique. Cementing agents like Portland cement lime and fly ash may also be used to improve the stability of soil. Bitumen has a very distinct property of binding and it can even bind non cohesive material. Lime can be suitably employed in highly plastic soil so as to improve stability of soil. Plastic soil shows varying properties in presence and absence of water. Water retaining agents like calcium chloride can provide the apparent cohesion in case of sands. Heat treatment when given to the plastic soil can improve the properties like shrinkage, swelling, etc. and such improved material can further be used as a stabilizing product in case of so many soils and giving very good result.

REVIEW OF LITERATURE

Navami Chandran B et al, (2017):"were study on two type of fiber bamboo fiber and banana fiber both are dried and cut in to equal length naturally occurring waste material for soil improvement by conducting compaction and CBR tests by adding different percentage of bamboo fiber and banana fiber are added to the soil and the optimum parentages found out. There was an increase in optimum moisture content with increase in percentage of bamboo fiber and banana fiber to the soil. The maximum dry density increases and Optimum moisture content decreases with increase in percentage of fiber. Addition of various percentages of fiber shows increased value for unconfined compression strength up to1% for bamboo fiber and 0.75% for banana fiber. The CBR value increases as amount of bamboo fiber increase up to 1% and banana fiber up to 0.5% then decreases on further addition. So 1% of bamboo fiber and 0.75% of banana fiber was taken as optimum percentage.

Poonam D et al (2017), Study to investigate the usefulness of Fly ash to stabilize silty soils. From the analysis of the results of this study, it appears that fly ash is not an effective stabilizer to stabilize silty soils. Addition of fly ash to the silt has shown no significant change in specific gravity, however increasing ash content tends to decrease plasticity properties. From the results of Compaction Test, it was observed that there is an increase in maximum dry density with the increasing ash content. Optimum Moisture Contents (OMC)

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

decreases with the increasing ash content. From this experimental work it may be concluded that fly ash is not very effective stabilizer to stabilize in ease of silty soil.

3.EXPERIMENTATION AND METHODOLOGY

Expansive Soil

Natural black cotton soil was obtained from the agricultural fields of Duvva, West Godavari District, Andhra Pradesh at a depth of 1 m below the ground level. The soil is dark grey to black in colour with light clay content. The obtained soil was air dried, pulverized manually and soil passing through 4.75 mm IS sieve was used. This soil is classified according to I.S classification as inorganic clay of high compressibility (CH). The properties of the expansive soil assessed based on relevant I.S. Code provisions, are given in Table 1.

Table 1- Properties of Expansive Soil

S.NO	Name of the Experiment	Properties of Soil
1	Free Swell Index (%)	130
2	Specific Gravity	2.50
3	GRAIN SIZE ANALYSIS % of Gravel % of Sand	 2.25 4.25
	% of Silt % of Clay	41 52.5
4	COMPACTION Optimum Moisture Content (%) Maximum Dry Density (kN/m^3)	 23 14.74
5	Unconfined Compressive Strength (kN/m^2)	36

Fly ash: Fly ash is material, was collected from Vijayawada Thermal Power Station, Vijayawada. The properties of Fly ash are furnished in Tables 2&3

Table 2 Properties of Fly ash

S.NO	Name of the Experiment	Properties
1	Free Swell Index (%)	-----
2	Specific Gravity	2.32
3	**Grain Size Analysis** % of Gravel % of Sand % of Fines	 0 6 94
4	**Compaction Parameters** Optimum Moisture Content (%) Maximum Dry Density (kN/m^3)	 25.4 11.67

Table: 3 Chemical Composition of Fly ash(Courtesy: VTPS, Vijayawada)

Name of the Chemical	Symbol	Range by % of weight
Silica	SiO_2	61 to 64.29
Alumina	Al_2O_4	21.60 to 27.04
Ferric Oxide	Fe_2O_3	3.09 to 3.86
Titanium dioxide	TiO_2	1.25 to 1.69
Manganese Oxide	MnO	Up to 0.05
Calcium Oxide	CaO	1.02 to 3.39
Magnesium Oxide	MgO	0.5 to 1.58
Phosphorous	P	0.02 to 0.14
Sulphur Trioxide	SO_3	Up to 0.07
Potassium Oxide	K_2O	0.08 to 1.83
Sodium Oxide	Na_2O	0.26 to 0.48
Loss on ignition		0.20 to 0.85

Plastic Fibers: Plastic Fibers were obtained from waste plastic cover. The average thickness of 2mm.Therefore a growing need to find alternative uses of reclaimed plastic bag waste to lengthen the usage time of the plastic material and thereby save the degrading environment.

4.RESULTS AND DISCUSSIONS:

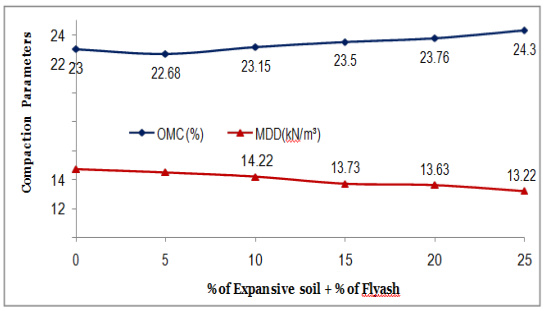

Fig.1 Variation of Compactiom Parameters for Expansive Soil Treated with Different Percentage of fly ash

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

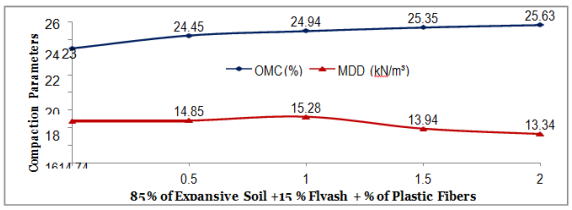

Fig.2 Variation of Compactiom Parameters for Expansive Soil Treated with Optimum Percentage of Fly ash with Different Percentages of Plastic Fibers

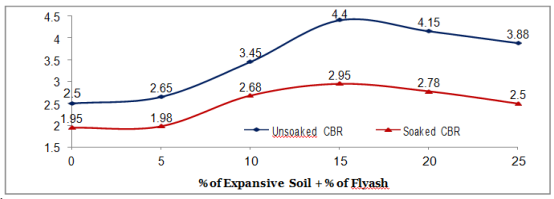

Fig.3 Variation of Soaked and Unsoaked CBR for Expensive soil with Different Percentages of Fly Ash

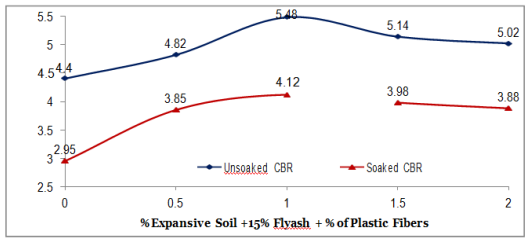

Fig. 4. : Variation of Unsoaked and Soaked CBR Values for Expansive Soil Treated with Optimum Percentage of Fly ash with Different Percentages of Plastic Fibers

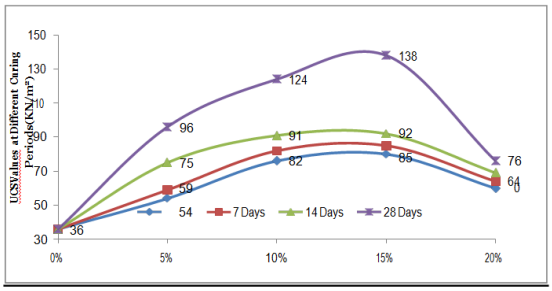

Fig.5 Variation Unconfined Compressive Strength of Expansive Soil Treated with Different Percentages of Fly ash at Different Curing Periods

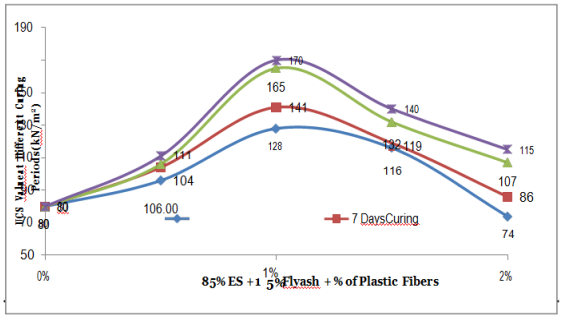

Fig.6 Variation Unconfined Compressive Strength of Expansive Soil Treated with 15 % Fly ash with Different Percentages of Plastic Fibers at Different Curing Periods

CONCLUSIONS.

•Flyash is beneficial in improving the properties of the soil and it acts immediately. It is an excellent soil stabilizing soil material which undergoes frequent swelling and shrinkage.

•Addition of Flyash has shown good decrement in liquid limit and plastic limit value from 71% to 42% and 37% to 19% respectively, as the flyash content varies from 0% to 20% with an incremental rate of 5% Flyash eventually decreases plasticity index value from 34.4% to 23% at 20% Flyash and swelling of expansive soil as a result of cation ions from the Flyash which reduces the volumetric changes

•With the increase in the percentage of Flyash the MDD decreasing from 14.74 kN/m3 to 16.71 kN/m3 on addition of 5% to 15% Flyash and further the MDD is increased i.e 16.4 kN/m3 due to the agglomerated and flocculated particles of Flyash mix soil occupy large voids

•C.B.R values of unsoaked sample increases from 2.5% to 4.4% up to the addition of 15% of Flyash, then decreases to 4.15% with the addition of 20% of Flyash to the Expansive soil.

•C.B.R values of soaked sample increases from 1.95% to 2.95% up to the addition of 15% of Flyash, then decreases to 2.5% with the addition of 20% of Flyash to the Expansive soil.

•From the evaluation of CBR test, it was decided that 15% is the optimum content of Flyash for treatment of Expansive soil

•UCS values of unsoaked sample increases from 36 kN/m2 to 80 kN/m2 up to the

addition of 15% of Flyash, then decreases to 60kN/m2 with the addition of 20% of Flyash to the Expansive soil.

•At 7 days the UCS values of soaked sample increases from 39 kN/m2 to 96kN/m2 up to the addition of 15% of Flyash, then decreases to with the addition of 20% of Flyash to the Expansive soil.

•At 14 days the UCS values of soaked sample increases from 75 kN/m2 to 92 kN/m2 up to the addition of 15% of Flyash, then decreases to 69kN/m2 with the addition of 20% of Flyash to the Expansive soil.

•At28 days the UCS values of soaked sample increases from 96kN/m2 to 138KN/m2 up to the addition of 15% of Flyash, then decreases to 76kN/m2 with the addition of 20% of Flyash to the Expansive soil.

•From the evaluation of UCS test, it was decided that 15% is the optimum content of plastic fibre for treatment of Expansive soil

REFERENCES

[1] AlWahab, R.M. and Al-Qurna, H.H., [1995],"Fiber Reinforced Cohesive Soils for Application in Compacted Earth Structures", Proceedings of Geosynthetics '95,IFAI,Vol.2, Nashville, Tennessee, USA, February 1995, pp. 433-446.

[2] Andrawes, K.Z. Editors, Thomas Telford, 1991, Proceedings of the International Reinforced Soil Conference held in Glasgow, Scotland, pp. 471-473.

[3] Anil Kumar Sharma and P.V. Sivapullaiah, (2011)," Soil Stabilization with Waste Materials Based Binder", Proceedings of Indian Geotechnical Conference December 15-17, 2011, Kochi (Paper No. H-119), pp.413-416.

[4] B Suresh, N Venkat Rao, K Arun Kumar and D M V Praneeth, (2017), "Stabilization of Expansive Soil with Polypropylene Fibre Along with Lime", International Journal of Advance Engineering and Research Development, Volume: 4, Issue: 12, pp.934-939.

[5] Bala Ramudu Paramkusam., (2013), "A study on CBR behavior of Waste Plastic (PET) on Stabilized Red Mud and Fly Ash", International Journal of Structural & Civil Engineering Res.Vol.2, Issue No. 3.

[6] Bansal, R.K., Pandey, P.k. and singh, S.K.,[1996] "Improvement of a Typical Clay for Roads Subgrades with Hydrated Lime", Proceedings of National Conf. onProblematic Subsoil Conditions, Terzghi-96, Kakinada, India, pp. 193-197.

[7] Bara, J.P., [1969] "Controlling the Expansion of Desiccated Clays During Construction", Proceedings of 2nd International Research and Engg. Conference on Expansive Clay Soils,Texas A&M Press, Texas, , PP. 380- 393.

[8] Boominathan, A. and Ratna Kumar, J. [1996],"Lime Treated Fly ash as embankment material", Proceedings of Indian Geotechnical Conference, IGC – 96, Madras, pp. 523 – 526. Chen, F.H.,[1988],"Foundations on Expansive Soils",Elsevier Pub Co., Amsterdam