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Study of Black Cotton Soil and Settled Soil Near Bhatghar Dam by Using Lime Rice Husk Ash and Fly Ash Stabilized

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Abstract: - Geotechnical application on one side and safe disposal of solid waste on the other side an attempt is disposal of solid waste on the other side an attempt is disposal of solid waste on the other side an attempt made is investigation to explore the possibilities of made is investigation to explore the possibilities utilizing solid waste to improve the engineering behavior of problematic soil in this present. It is found that Black cotton soil mainly stabilized using Fly ash, rice husk ash and Lime. Combination of Fly ash, rice husk ash and Lime proves to be very effective and cheaper method of stabilization. Stabilization of soils is an effective method for improvement of soil properties.

Key Words: - ***Black cotton soil, Rice husk ash, Lime, Fly ash, Rice Husk Ash Liquid limit, Plastic limit.***

I. INTRODUCTION

Bhatghar dam is constructed on Yelwanti river is a concrete structure. The dam was built in 1927 and mainly for generating electricity and irrigations maximum height of dam 57.2m length 1625m. It is 40km from pune. Soil is defined as unconsolidated material, composed of solid particles, produced by physical and chemical disintegration of rocks.

The process of soil stabilization refers to changing the physical properties of soil in order to improve its strength, durability, or other qualities. The process of soil stabilization refers to changing the physical properties of soil in order to improve its strength, durability, or other qualities. Typically, this is important for road construction, and other concerns related to the building and maintenance of infrastructure.

Maharashtra is a state located in West India. Maharashtra encompasses an area of 308,000 km² (119,000 mi²) and is the third largest state in India. The Western Ghats better known as Sahyadri, are a hilly range running parallel to the coast, at an average elevation of 1,200 meters (4,000 ft). To the west of these hills lie the Konkan coastal plains, 50–80 kilometers in width. To the east of the Ghats lies the flat Deccan Plateau. There are many multi-state irrigation projects in development, including Godavari River Basin Irrigation Basin. The plateau is composed of black basalt soil, rich in humus. Farmers in the region are economically well off due to fertile land and good irrigation. Soil is defined as unconsolidated material, composed of solid particles, produced by physical and chemical disintegration of rocks. Expansive soil can also be termed as clayey soil that has a high potential for shrinking or swelling due to change in moisture content, which leads to instability of the soil. Clayey soil is a fine-grained soil with particle size smaller than 0.002 mm that combines with one or more clay minerals with traces of metal oxides and organic matter. Montmorillonite, a mineral formed due to the chemical weathering of the volcanic ash is the principal constituent. Expansive soils can be found in almost all the continents.

The utilization of rice husk ash (RHA) in the geotechnical application has not been readily accepted due to the low level of confidence in its effectiveness among geotechnical engineers. For this reason, there is a need to fill the gaps currently hindering the full potential of RHA to be harness. The study presented in this paper aimed to provide and guidance on the use of RHA particular for expansive soil.

From the study of topographical & soil map of India, it is found that about 3 lakh sq. meter area of our country is covered by poor quality clayey or black cotton soil.

Which extent over an almost central area of the country B.C. soil is residual soil and derives from basalt or traps and contains the clay mineral montmorillonite which is responsible for excessive swelling and shrinkage 0characteristic of the soil.

In Maharashtra state, there is a lot of production of fly ash & rice husk. The advantages of fly ash are that its availability. So by blending fly ash with black cotton soil which is available in maximum areas of our state, the property of natural B.C. soil like C.B.R. can be increased. The use of such

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plantation in the construction of foundations, road pavements etc. will also prove to be economical and eco-friendly.

II. MATERIAL AND METHODS USED

For this purpose, we had collected different materials such as fly ash, rice husk and lime from different industries which generate this as a solid waste while running their industries. These were generated in a large amount and their disposal is quite costly also so to minimize a load of landfills we did such experiments.

Fig.1. Ricehuskash

Fig.2. Fly ash

Fig.3. Lime

III. TEST AND TESTING METHODOLOGY

A. *Natural Moisture Content:*

The water content(w)is defined the ratio of the mass of solids. The water content of the soil is an important property. The characteristics of the soil, especially a fine- grained soil, change to a marked degree with a variation of its water content. This test was carried out as per IS2720 part-2[4].

B. *Consistency Limit:*

Consistency of fine grain soil is the physical state in which it exists. It is used to donate degree of firmness of soil. Consistency soil is indicated by such term as soft, firm or hard. The water content at which the soil changes from one state to another are known as consistency or Atterbergs limits [5].

C. *Liquid Limit:*

Liquid limit is the water content at which the soil changes at which the soil changes from the liquid state to the plastic state. It can be determined in the laboratory either by Casagrande's apparatus or by cone penetration methods. As described in IS2720 part-5.

D. *Plastic Limit:*

Plastic limit is the content below which the soil stops behaving as a plastic material. It begins to crumble when rolled into a thread of soil of 3mm Dia. At this water content, the soil loses with plasticity and passes to a semi- solid state. The test procedure adopted is according to IS2720 part-5[5].

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E. Free Swelling Index:

Free swelling is the increases in the volume of soil, without any external constraints, submergence in water. The possibility of damage to the structure due to swelling of expensive clays need to be identified to the out sat, by an investigation of those soils likely to possess undesirable expansion characteristics. This test is carried out as per IS2720 part-40.

F. Modified Proctor Test:

The modified Proctor test is developed to represent heavier compaction than that in the standard Proctor test. The test is used to simulate the field condition where heavy rollers are used. This test is carried out as IS2720 part-16.

Fig. 4. Liquid limit

G. California Bearing Ratio (CBR):

The CBR test is a type of test develops by the California division of highway in 1929. This test is used for suitability of subgrade and the material used in sub base & base course. The test results have been correlated to the thickness of various materials required for flexible pavement. The test consists of causing the plunger to penetrate the prepared specimen at the rate of 1.25mm/min. the loads required for penetration of 2.5mm &5mm are recorded by proving ring attached with a plunger. The load is expressed as % of the standard load at the respective deformation level and is known as CBR value the test is carried out as per procedure in IS2720 part-16[6].

H. Specific Gravity:

Specific gravity of solid particles (G) is defined as the ratio of the mass of given volume of solid to the mass of an equal volume of water at 27 degrees Celsius the test is carried out as per IS2720 part-3[6]. problematic soil clay and alluvial soil with increasing % of solid wastes

Table.1. Modified procotar Test.

S. No.	Mass Of Mould + Soil	Mass Of Soil	Bulk Density	Water Content	Dry Density
1.	5227.5	1476	1.48	0.114	1.33
2.	5301.5	1550	1.55	0.13	1.37
3.	5371	1619.5	1.62	0.15	1.42
4.	5466	1766.5	1.71	0.22	1.39

IV. RESULTS AND DISCUSSION

In this experimental result we see that the plastic limit value is 37% and liquid limit value 26%, it is good.

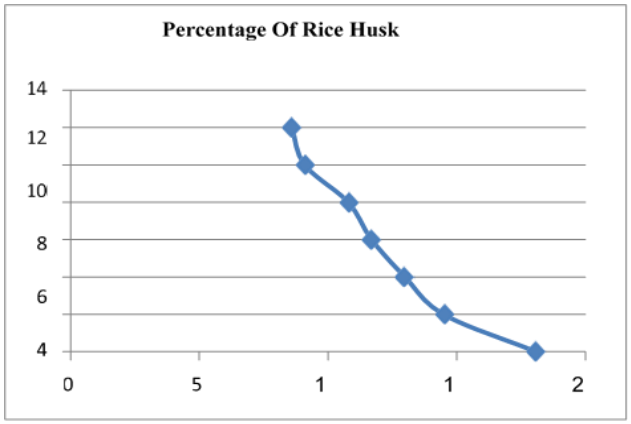

Fig.5. Percentage of rice husk

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Table.2. Soil and fly ash

Soil + % Fly ash (gm)	Vol. of Water	Sp. wt=W/V (KN/m^3)
100 + 0 = 100	555 - 500 = 55	10 x 1.81 = 18.1
100 + 2 = 102	560 - 500 = 60	10 x 1.7 = 17
100 + 4 = 104	570 - 500 = 70	10 x 1.4 = 14
100 + 6 = 106	590 - 500 = 90	10 x 1.3 = 13
100 + 8 = 108	595 - 500 = 95	10 x 1.13 = 11.3
100 + 10 = 110	610 - 500 = 110	10 x 1.0 = 10
100 + 12 = 112	640 - 500 = 115	x .97 = 9.7

We see that chemically RHA is lacking in cementations materials, but it contains pozzolanic materials. In general, the plasticity index reduces associated with the addition of RHA. The reduction of plasticity index is an indicator of improvement which can be related to increase in soil strength and decrease in swelling and compressibility. Consumption of rice husk ash in bulk quantity in the construction of road project can be made with reducing the accumulation hazard and environmental pollution of this waste Addition of rice husk ash in increasing proportion with the alluvial soil decreases the maximum dry.

Table.3. Soil and Rice Husk

Soil + Rice Husk (gm)	Volume of Water (ml)	Sp. Wt = W/V (KN/m^3)
100 + 0 = 100	555 - 500 = 55	10 x 1.81 = 18.1
100 + 2 = 102	570 - 500 = 70	10 x 1.45 = 14.5
100 + 4 = 104	580 - 500 = 80	10 x 1.3 = 13
100 + 6 = 106	600 - 500 = 100	10 x 1.17 = 11.7
100 + 8 = 108	620 - 500 = 120	10 x 1.08 = 10.8
100 + 10 = 110	630 - 500 = 130	10 x .91 = 9.1
100 + 12 = 112	640 - 500 = 140	10 x .86 = 8.6

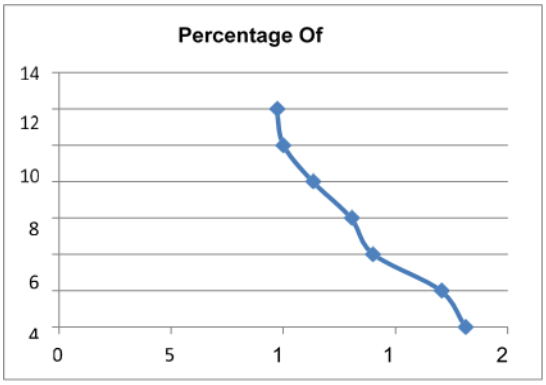

Fig. 6. Percentage of soil

Table.4. Soil, Flay ash, rice husk, lime

Soil +Fly ash + Rice Husk + Lime (gm)	Volume of Water (ml)	Sp. Wt = W/V (KN/m^3)
100 + 2 + 2 + 0 = 104	556 - 500 = 56	10 x 1.85 = 18.5
100 + 2 + 2 + 1 = 105	556.1- 500 =56.1	10 x 1.87 = 18.7
100 + 2 + 2 + 2 = 106	556.2 - 500 =56.2	10 x 1.88 = 18.8
100 + 2 + 2 + 3 = 107	556.3 – 500=56.3	10 x 1.9= 19
100 + 2 + 2 + 4 =YY108	558 - 500 = 58.0	10 x 1.86 = 18.6
100 + 2 + 2 + 5 = 109	559 - 500 = 59	10 x 1.84 = 18.4
100 + 2 + 2 + 6 = 110	562 - 500 = 62	10 x 1.77 = 17.7

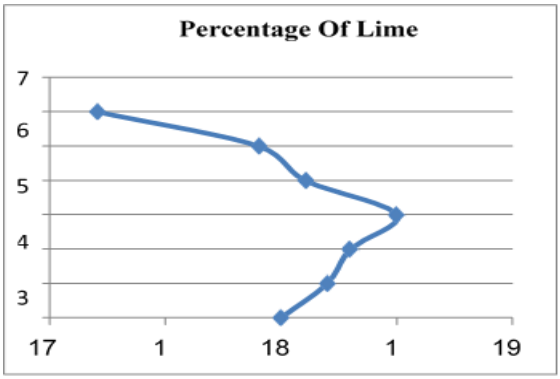

Fig.7. Percentage of Lime

V. CONCLUSIONS

In general, the addition of RHS solely decreases the plasticity of expansive soil, as a result of reducing liquid limit and increasing the plastic limit. Addition of RHA significantly reduces the plasticity index, whereas as much as 80% of reduction is achieved by the addition of RHA in greater lime content. It is noticed that 6% lime addition is enough to improve the consistency limits of expansive soils

The swelling and swelling pressure of expansive soils decrease in concomitant with the addition of lime and RHA. The swelling of expansive soil is almost zero when it is added 6% lime and 6% RHS. Fly ash has good potential for use in the geotechnical application. When used in structural fills or embankments, fly ash offers several advantages over natural soils or rock. The relatively low unit weight of fly ash makes it well suited for placement over soft or low bearing strength soils

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