STABILIZATION OF SOIL BY USING RICE HUSK ASH

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Abstract India has an all out street organization of around 4.7million kilometers. 53% of the absolute street network is cleared. The planned sum spent over streets is Rs.14, 90,925 Croce. The solidness and usefulness of asphalts rely mostly upon strength of sub grade, which can be upgraded by ground improvement procedures. The field of ground improvement by the utilization of waste rice husk debris for this reason. India is one of the world's biggest makers of rice. This concentrate thusly produces the survey of the results of rice husk debris on the properties of soil connected with asphalt, for example, Ideal Dampness Content (OMC), Greatest Dry Thickness (MDD) and California Bearing Proportion (CBR).

In India the dirt generally present is Mud, in which the development of sub grade is risky. As of late the requests for sub level materials has expanded due to expanded constructional exercises in the street area and because of scarcity of accessible close by grounds to permit uncover fill materials for making sub level. In this present circumstance, a way to conquer this issue is to use the different option created squander materials, which cause not just ecological risks and furthermore the depositional issues. Keeping this in view adjustment of feeble soil in situ might be finished with reasonable admixtures to save the development cost significantly.

The current examination has accordingly been done with rural waste materials like Rice Husk Debris (RHA) which was blended in with soil to concentrate on progress of feeble sub grade concerning compaction and strength qualities. Silica created from rice husk cinders have explored effectively as a pozolanic material in soil adjustment. Due to various construction development projects undertaken all over the world there is a substantial increase in the production of waste materials rice husk. Which create disposal problems. Rice husk waste is produced in large quantity in rice husk mills and is disposed in open land. Therefore use of rice husk in foundation of buildings and in road constructions to improve bearing capacity of soil and to reduce the area of open land needed for its disposal and to preserve environment through resource conservation, RHA mix with black cotton soil by mass in proportion of 4%, 8%, 12%, 16%. And then geotechnical properties are evaluated.

KEYWORDS- Black cotton soil, Rice husk ash, OMC, MDD, CBR

1. INTRODUCTION

Civil engineering projects located in areas with soft or weak soils have traditionally incorporated improvement of soil properties by using various methods. Soil Stabilization is being used for a variety of engineering works, the most common application being in the construction of road and pavements, where the main objective is to increase the strength or stability of soil and to reduce the construction cost by making best use of the locally available materials. Over the times, rice husk ash is the materials used for stabilizing soils. Thus the use of Agricultural waste (such as rice husk ash -RHA) will considerably reduce the cost of Construction and as well reducing the environmental hazards they cause. Rice husk is an agricultural waste obtained from milling of rice. About 108 tons of rice husk is Generated annually in

the world. Hence, use of RHA for upgrading of soil should be encouraged.

Because expansive clays are characterized by excessive compression, dispersion, collapse, low shear strength, low bearing capacity, and high swell potential, such soils are unsuitable for road sub grade layer construction. Expansive clays usually experience large volume changes depending on the amount of water contained in the soil voids. Such soils can form deep cracks in drier seasons and expand dramatically when wet. Such instability affects the strength performance of soil as a construction material. Volume changes involving shrinkage and swelling cause deformation of the road surface, whereas increased moisture content in 0expansive clay soils significantly reduces soil bearing strength. Soils with low-bearing capacity can be strengthened economically for building purposes through the process of "soil stabilization" using different types of stabilizers.

Soil stabilization

Soil stabilization is the process of improving its geotechnical properties of soil. Soil adjustment includes the utilization of settling specialists (folio materials) in feeble soils to further develop its geotechnical properties like compressibility, strength, penetrability and solidness. The parts of adjustment innovation incorporate soils and additionally soil minerals and balancing out specialist or covers, soil adjustment targets further developing soil strength and expanding protection from mellowing by water through holding the dirt particles together.

Rice Husk Ash

Rice husk is a side-effect of the rice processing. Around 110 million tons of husk each year are created across the world. Because of its rough person, it isn't appropriate as creature feed. High lignin and debris content make it inadmissible for paper fabricating. During processing of paddy, around 75% is acquired as rice and grain and rest 25% as husk. The husk got is utilized as fuel for handling paddy in rice plants and for delivering energy through direct ignition. After consuming, 25% of husk gets changed over into debris and remaining is unpredictable matter. This RHA is an extraordinary danger to the climate which can harm encompassing region and land where it is unloaded. For its powerful removal it tends to be utilized as pozzolanic material in substantial creation, sponges for oils and synthetic compounds and for soil adjustment.

Rice husk ash

Chemical Composition of RHA

Constituent	Percentage (%)
Silica (SiO_2)	87.12
Aluminium Oxide (Al_2O_3)	3.27
Ferric Oxide (Fe_2O_3)	1.45
Calcium Oxide (CaO)	2.79
Magnesia (MgO)	0.63
Loss in Ignition	4.50

Physical Properties of RHA

Property	Value
Grain Size Distribution (% Finer than)	
4.75mm	100.00
2.8mm	97.21
2mm	95.45
1.18mm	93.87
600µ	89.63
300µ	79.42
150µ	46.56
75µ	17.90
Specific Gravity	2.07

Objectives of the study

This study was oriented towards improving the strength of soil by using locally available agricultural and cattle waste to reduce the construction cost. The

different stabilizing agents are used Rice husk ash (RHA).The present study was undertaken with the following objectives:

1. To explore the possibility of using rural waste materials like RHA, in soil stabilization.
2. To investigate the chemical and physical properties of stabilizing agents and there suitability.
3. To investigate the physical and engineering properties of natural soil and stabilized soil by adding 2.5%,5%,7.5%,10% and 12.5% of ash in soil.
4. To compare the thickness of the pavement for maximum value of soaked CBR obtained for stabilized soil with soaked CBR value of natural soil.

2. LITERATURE STUDY

Yadu et al. (2011) introduced the lab investigation of dark cotton soil balanced out with fly debris (FA) and rice husk debris (RHA). The examples of these dirts were gathered from a provincial street situated in Raipur of Chhattisgarh state. The dirt was balanced out with various rates of FA (i.e., 5, 8, 10, 12, and 15%) and RHA (i.e., 3, 6, 9 11, 13, and 15%). As far as possible, explicit gravity, California bearing proportion (CBR), and unconfined compressive strength (UCS) tests were performed on crude and settled soils. Results demonstrated that expansion of FA and RHA lessens the pliancy file (PI) and explicit gravity of the dirt.

Rao.,Pranav , Anusha et.al (2012) has led a point by point concentrate on extensive soils with the expansion of RHA, lime and gypsum on properties of sweeping soil like Atterberg's cutoff points, compaction, strength, CBR and free swell record. It was seen that the fluid furthest reaches of the broad soil has been diminished by 22% and Free Swell File by 88% with the expansion of 20% RHA+5% Lime. The improvement of 548% in UCS and momentous expansion in CBR esteem was likewise seen on expansion of 20% RHA+5% lime + 3% Gypsum.

3. MATERIALS USED IN THE STUDY

Red soil

The red soil shown in Figure 3.6 is the red coloured fine grained residual soilcollected from the shallow surface, which is not suitable for the construction ofpavements. The red soil is used in the present study for comparison of properties assub-grade soil to the cement and flyash and also characterization of stabilized red soilwith ferrochrome slag as sub-grade soil for the construction of pavement.

Red soil

Rice husk ash

Rice husk is a farming buildup which represents 20% of the 649.7 million tons of rice delivered every year around the world. The delivered halfway consumed husk from the processing plants when utilized as a fuel additionally adds to contamination and endeavors are being made to conquer this ecological issue by using this material as a strengthening cementing material. The synthetic sythesis of rice husk is found to fluctuate starting with one example then onto the next because of the distinctions in the kind of paddy, crop year, atmosphere and geographical conditions.

4. METHODOLOGY USED

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge.

Collection of samples

For this project we are collected soil, cement, fly ash from various sources, for conducting several tests which are included in the project work. And finding all the parameters of the samples which are useful for determining the standards of the different samples.

Tests performed on sample

Plastic Limit

Plastic Limit is the empirically established moisture content at which a soil becomes too dry to be plastic. It is determined out by rolling out a thread of fine portion of soil on a flat non-porous surface plate of size 3 mm without crumbling. The Plastic Limit is used to determine the amount of water that is required by the particular samples.

Liquid Limit

It is the minimum water content at which the soil is still in liquid state, but has a small shearing strength. The liquid limit is defined as the percentage of moisture content at which a soil changes with decreasing wetness from liquid to plastic consistency or vice-versa. It is the water content at which the soil changes from liquid limit to plastic limit.

Specific Gravity

It is used to define the weight or density of a sample as compared to the density of an equal volume of water. It is an important weight-volume property that is helpful in classifying soil and in finding other weight-volume properties like void ratio, porosity and unit weight.

Sieve Analysis

A sieve analysis is a practical or procedure used to assess the particle size distribution of a granular material by allowing the materials to pass through a series of sieves of progressively smaller mesh size and weighing the amount of material that is stopped by each sieve as a fraction of the whole mass. A size distribution is often of critical importance to the way the material performance in use.

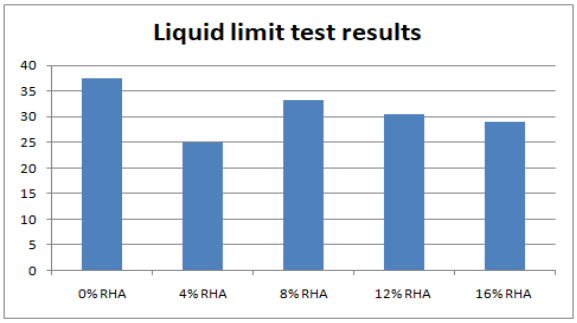
Compaction Test

Soil Compaction is one of the most critical components in the construction of highway embankments, foundations and many other engineering structures. Compaction is the mechanical energy to a soil to rearrange the particles and reduce the void ratio. The principal reason for compacting soil is to reduce subsequent settlement under loads. This is important in case to increase the shear strength and decrease in compressibility, permeability.

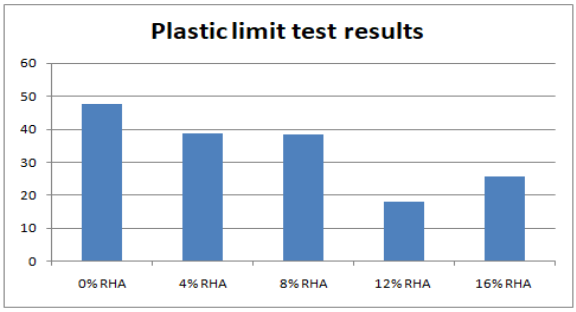
UCS Test

The primary purpose of the UCS Test is to quickly determine a measure of the UCS of fine grained soils that possess sufficient cohesion to permit testing in unconfined state. This measure is then used to calculate the unconsolidated undrained shear strength of the soil under unconfined conditions. It is a simple laboratory testing method to assess the mechanical properties of fine grained soils.

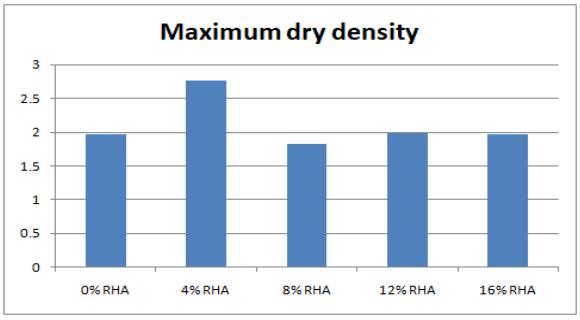
5. RESULTS AND ANALYSIS



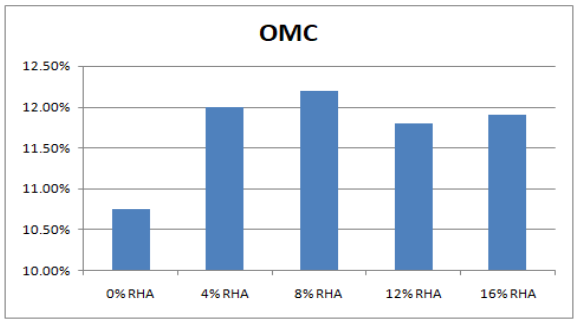
Graph 1: Liquid limit test results



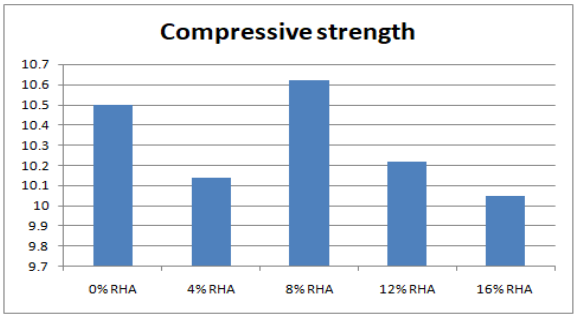
Graph 2: Plastic limit test results



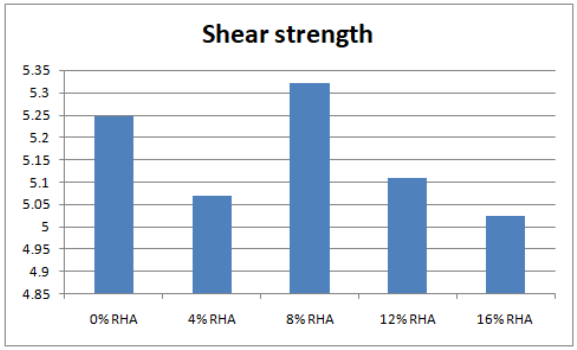
Graph 3: Maximum dry density results



Graph 4: OMC results



Graph 5: Compressive strength values



Graph 6: Shear strength values

6. CONCLUSIONS

1. From this study it was concluded that the value of liquid limit decreases with increasing the percentage of RHA.
2. By using RHA materials we can decrease the waste materials from the environment.
3. The value of plastic limit is also decreases with increasing the percentage of rice husk ash.
4. The optimal value of compaction was observed at 4% RHA materials. And the optimal value of OMC was observed at 8% RHA materials in soil.
5. The value of compressive strength of the soil increases from 0% to 8% waste materials after 8% it will decreases gradually up to 16% waste.
6. The optimal value of shear strength was observed at 8% rice husk ash than reaming trials.

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