EFFECT OF MARBLE DUST & RICE HUSK ASH TO STABALIZE EXPANSIVE SOIL

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Abstract - An environment friendly and economical way of soil stabilization is with the help of industrial waste. Unsuitable highway subgrade, foundation soil of heavy building or water reservoirs etc. requires stabilization to improve its engineering properties. The project is planned to conduct various geotechnical lab test like unconfined compressive strength test, shrinkage test, swelling test, permeability test, Atterberg limit and shear strength test. The purpose of this study is to evaluate the effect of MD & RHA used to enhance the properties of expansive soil.

Keywords - environment friendly, marble dust, rice husk ash, expansive soil.

I. INTRODUCTION

Expansive soils can be a significant problem in engineering purposes and stabilization is necessary to relieve their damaging effects. Lime, cement and bitumen are commonly used additives. Recently, different stabilizer materials such as fly ash, rice husk ash, silica fume, ladle furnace slag and geo fibres are used to improve some geotechnical properties. Construction on expansive soil always creates a problem for civil engineers because of its peculiar cyclic swell shrink behaviour. This type of soil swells when it comes in contact with water and shrinks when the water evaporates out. Because of this movement lightly loaded structures such as foundations, pavements, canal beds and linings and residential buildings founded on them can be severely damaged (Bhambulkar et al.,2019,2013,2015,2019).

The clay mineral montmorillonite is mostly responsible for this type of nature of the soil. There are different methods of altering the nature of this soil to make it fit for construction, stabilization using industrial wastes is one of them.

Rice husks are the shells produced during de--husking operation of paddy, which varies from 20% to 23% by weight of the paddy. The rice husk is considered as a waste material and is being generally disposed of by dumping or burning in the boiler for processing paddy. The burning of rice husk generates about 20% of its weight as ash. Silica is the main constituent of rice husk ash (RHA) and the quality (% of amorphous and unburnt carbon) depends upon the burning process. The RHA is defined as a pozzolanic material due to its high amorphous silica content.

II. LITERATURE REVIEW

"STABILIZATION OF PLASTIC SOIL USING MARBLE DUST, RICE HUSK AND FLY ASH"

Large areas are covered with highly plastic soil, which is not suitable for construction purpose. In urban areas, borrow earth is not easily available which has to be hauled from a long distance. Instead of borrowing a suitable soil from long distance it is economical to use locally available plastic soil after stabilization with cost effective and easily available industrial wastes. In this present study, components used are marble dust which is an industrial waste product, fly ash and rice husk which are agricultural waste products. The project is planned to conduct various geotechnical lab test like unconfined compressive strength test, shrinkage test, swelling test, permeability test, Atterberg limit and shear strength test. The objective of this study is to evaluate the effect of materials used to enhance the properties of plastic soil by comparing with the results and graphs of various mixes. This stabilization technique is cost effective and has an additional benefit of providing an environmental friendly way to deal with industrial waste product(Bhambulkar et al.,2018,2020).

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"EVALUATION OF MARBLE DUST FOR SOIL STABILIZATION"

This volume change is realized by swelling upon wetting, and shrinkage upon drying. Being constructed on expansive soils, buildings are frequently prone to severe movement caused by non-uniform soil moisture changes with consequent cracking and damage related to the distortion. Rainfall and evaporation, garden watering, leaking water pipes, or tree root activity may trigger these moisture changes. In this Study, an attempt has been made to improve the bearing capacity of soil using admixtures/Alternate materials.

"IMPACT OF MARBLE POWDER ON ENGINEERING PROPERTIES OF BLACK COTTON SOIL"

-The black cotton soil is expansive type of soil which expand suddenly and start swelling when it comes in contact with moisture. Due to this property the strength and other properties of soil are very poor. Expansive type of soil shows unpredictable behaviour with different kind of stabilizers. Soil stabilization is a process to treat a soil to maintain, alter or improve the performance of soil. In this study, the potential of marble dust (by-product of marble industry) as stabilizing additive to expansive soil is evaluated. The evaluation involves the determination of the swelling potential of expansive soil in its natural state as well as when mixed with varying proportion of marble dust (from 30 to 50%).

"EFFECT OF MARBLE DUST ON SOIL PROPERTIES"

The main objective of this study is to investigate the use of waste marble dust in geotechnical applications and to evaluate the effects of marble dust on OMC & MDD and CBR values of unsaturated soil by carrying out Standard Proctor Test and CBR test on different soil samples(Bhambulkar et al.,2021).. The results obtained are compared for the three-different percentage of marble dust and inferences are drawn towards the bearing strength of soil with different combination of marble dust. In this study, the waste material of marble industry, were used for stabilization of clayey soils.

"STABILIZATION OF EXPANSIVE SOIL WITH MARBLE DUST AND ALCCOFINE Sachin Dev, Er. Neeraj Sharma"

Expansive or reactive soil is a soil composed predominantly of clay. Clay undergoes significant volume change in response to changes in the soil moisture content. This volume change is realized by swelling upon wetting, and shrinkage upon drying. Being constructed on expansive soils, buildings are frequently prone to severe movement caused by non-uniform soil moisture changes with consequent cracking and damage related to the distortion(Bhambulkar et al.,2013).. Rainfall and evaporation, garden watering, leaking water pipes, or tree root activity may trigger these moisture changes. In this Study, an attempt has been made to improve the bearing capacity of soil using admixtures/Alternate materials.

III. SCOPE & OBJECTIVE

- **SCOPE**:

Construction materials are more judged by their ecological characteristics because of the continual depletion of quarry aggregates. In India, huge amount of marble waste is being generated because of lack of technology and also unscientific methods of quarrying marble. Due to generation of marble waste there is a direct exposure of this material with the environment because of which serious environmental problems occur. Also, the marble cutting industry generates a high volume of wastes. Not much of the work has been done on the use of RHA as a soil stabilizer. Except few studies where RHA solely has been used to increase the workability or performance of soil. The National and International Scenario of the past studies can be concluded in a statement that so far, no evidence has been found where marble dust and RHA are used collectively for soil stabilization. In the present study, the attempt has been made to do the same. Thus, soil stabilization with use of marble dust in presence of RHA would be quite beneficial.

- **OBJECTIVE**:

This research is an attempt to investigate the effect of marble dust and RHA on the stabilization of expansive soils. This main objective of this study will be to stabilize the expansive soil by adding marble dust at varying %ages and adding RHA as an additive to attain the following objectives:

1) To study the effect of Marble dust on Compaction, UCS, Soaked CBR, swelling pressure and durability characteristics of an expansive soil stabilized with optimum percentage of Rice husk ash.

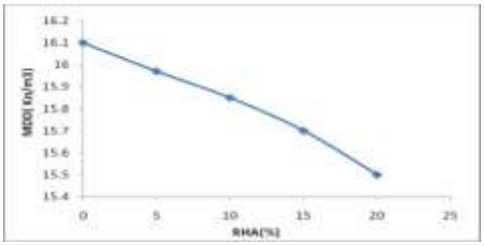
2) To utilize the waste material of marble dust in stabilizing the expansive soil, which otherwise will be very uncomical.

3) To optimize the properties of expansive soil using marble dust and RHA to get the maximum strength.

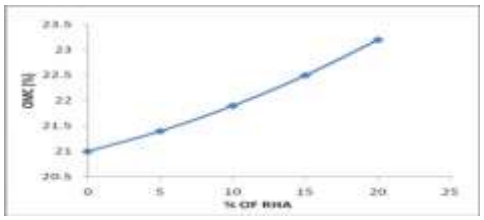
4) Due to the increasing cost of high quality materials needed for different geotechnical projects, engineers try to improve the physical properties of local soils through different methods and techniques.

IV. RESULTS

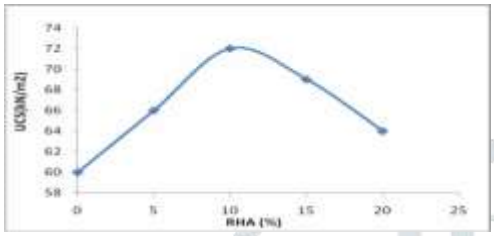
Figure 1 shows the variation of MDD of expansive soil with addition of different percentage of Rice husk ash



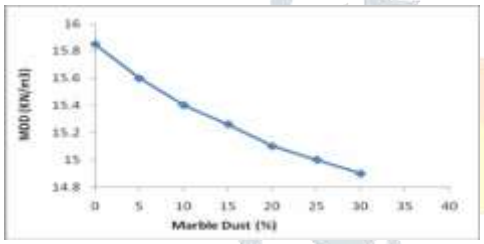
The OMC goes on increasing irrespective of percentage addition of RHA.



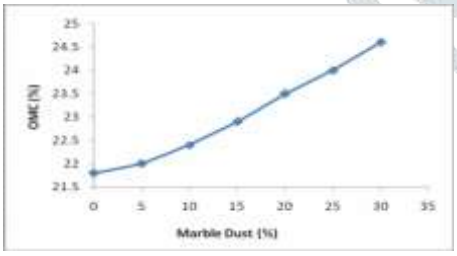
By increasing the percentage of addition of RHA the UCS of soil goes on increasing up to 10% addition of RHA, further addition of RHA, decreases the UCS of the expansive soil.



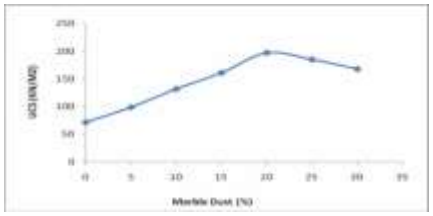
The variation of MDD of the RHA stabilized expansive soil treated with different percentage of Marble dust has been shown in Fig.4 .It is observed that by addition of 10% of RHA, the MDD of soil decreases to 15.85 kN/m ^{3} from 16.1 kN/m ^{3} .



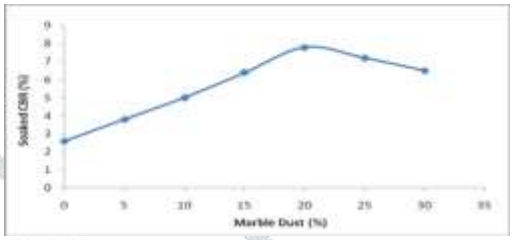
The variation of OMC of the RHA stabilized expansive soil treated with different percentage of Marble dust has been shown in Fig.



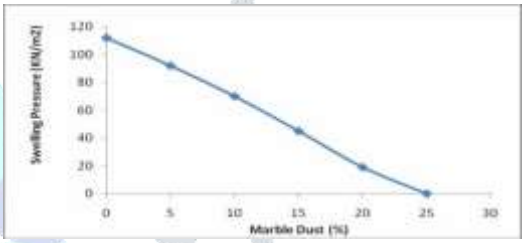
It is observed that by addition of 10% RHA the UCS of soil increases to 72 kN/m ^{2}. After 20% addition of Marble dust,the strength decreases because of the availability of extra Lime to react with the insufficient amorphous silica and Alumina present in soil and RHA , which results in carbonation reaction and strength decreases.



Variation of Soaked CBR of RHA stabilized soil with % of Marble Dust



Variation of Swelling pressure of RHA stabilized soil with % of Marble Dust



V. Conclusions

The optimum percentage of RHA in stabilization of expansive soil is found out be 10%. The MDD goes on decreasing and OMC goes on increasing irrespective of the percentage of addition of Marble dust to RHA stabilized expansive soil. For best stabilization effect, the optimum proportion of Soil: Rice husk ash: Marble dust was found to be 70: 10: 20. This method of soil stabilization is very effective and economical in the stabilization of expansive soil. It is seen from the test results that the addition of marble dust enhances the strength values of soil. The OMC of soil- marble dust mix increases with increasing the percentage of marble dust. The maximum dry density (MDD) is observed to decrease with increase in the percentage of marble dust. The dry density is decrease when the soil mixed with different percentage of marble dust.

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