

Soil Stabilization by Using Foundry Sand and Rice Husk Ash

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Abstract – The foundry sand and RHA is the waste therefore the cost of stabilize soil is less as compare to other material. The foundry sand are coming from the industry waste and RHA is a waste material from paddy crop After burning it gives the rich amount of silica which may be used as chemical stabilizer for soil stabilization. The complete analysis of the improvement of soil properties and its stabilization using Rice Husk ash and Foundry sand. Soil is the basic foundation for any civil engineering structures. It is required to bear the loads without failure. In some places, soil may be weak which cannot resist the oncoming loads. In such cases, soil stabilization is needed. Numerous methods are available in the literature for soil stabilization. In this study 'Rice Husk and Foundry sand' is mixed with soil to investigate the relative strength gain in terms of bearing capacity and compaction. The effect 'Rice Husk and Foundry sand' on the geotechnical characteristics was investigated by conducting 'standard proctor compaction tests'. The test were performed as per Indian Standard specifications.

Key Words: Stabilization, foundry sand, Rice Husk Ash, Compaction, OMC, MDD

1. INTRODUCTION

Soil stabilization is the alteration of soil properties to improve the engineering performance of soils. The properties most often altered are density, water content, plasticity and strength. Modification of soil properties is the temporary enhancement of sub grade stability to expedite construction. We are going to use foundry sand and rice husk as stabilizer. Foundry sand Rice husk is a by-product generated during rice milling. Rice husk ash (RHA) is about 25% by weight of rice husk ash.

Soil stabilization can be utilized on roadways site development projects airports and many other situations where sub-soils are not suitable for construction such as for expensive soil granular materials and soil with low bearing capacity.

Soil stabilization is the alteration of soil to enhance their physical properties stabilization can increase the shear strength of soil and or control the shrink swell properties of a soil does improving the load bearing capacity of sub grade

to support payments and foundations soil stabilization can be utilized on road with parking area site development projects airport and many other situations where soil are not suitable for construction stabilization can be used to treat a wide range of sub grade materials wearing from expansive clay to granular materials and additive is then placed on top of this material this additive is mixed and remixed with the soil until the desired properties are achieved.

1.1 Materials

Soil – We used locally available soil near sanjay ghodawat university, Atigre, Kolhapur, Maharashtra for conducting the test.

Foundry sand –

Foundry sand is top quality silica sand that's a by product from the assembly of every ferrous and non ferrous metal casting. Metal foundries use massive amount of sand as a part of the metal casting method. Once used sand should not be reused within the metal works, which termed as foundry sand. Foundry sand production is almost six to ten million tons annually in India.

Rice Husk Ash-

Rice milling generates a by-product known as husk. This surrounds the paddy grain. During milling of paddy about 78% of weight is received as rice, broken rice and bran. Rest 22% of the weight of paddy is received as husk. This husk is used as fuel in the rice mills to generate steam for the boiling process. This husk contains about 75% organic volatile matter and the remaining 25% of the weight of this husk is converted into ash during the firing process, known as Rice Husk Ash (RHA). This RHA in turn contains around 85% - 90% amorphous silica.

1.2 Test conducted :

Standard Proctor Test (For Heavy Compaction):

Standard Proctor tests were conducted to determine optimum moisture content and maximum dry density of original soil and for the soil mixed with different percentages of fines obtained from rice husk waste (i.e. 5%, 10%, 15% and 20%) and constant percentage of foundry sand waste by weight of the soil solids. This tests were conducted to prepare specimens at maximum dry density by adding desired optimum moisture content as per specifications of IS: 2720 (Part7) 1980.

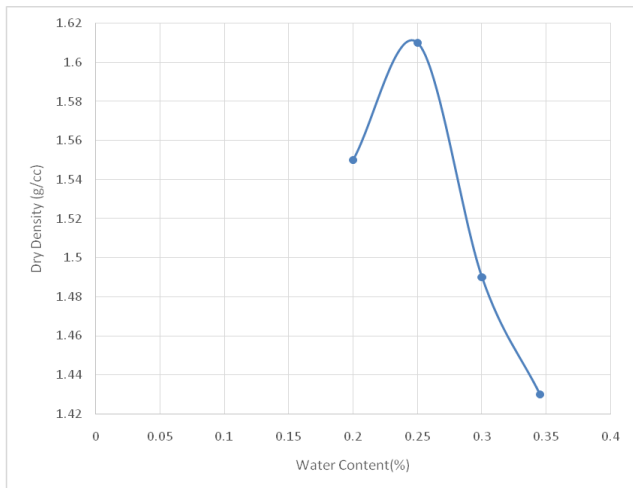
2. Result :

Standard Proctor Test

2.1. soil sample

Table -1:

Water Content	0.2	0.25	0.3	0.345
Dry Density	1.55	1.61	1.49	1.43

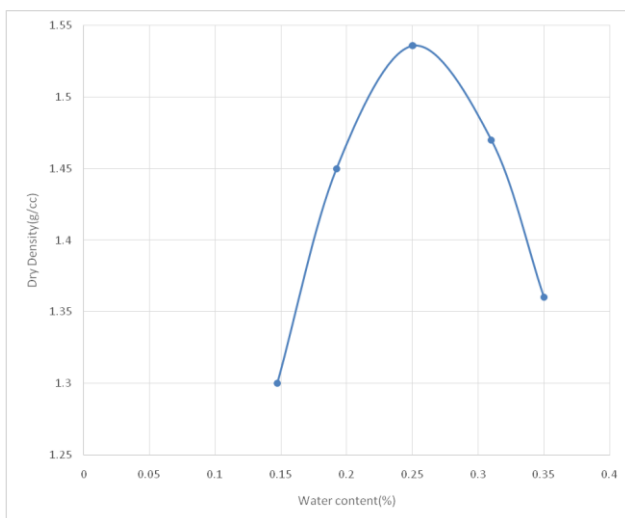


Graph -1: water content vs Dry Density

2.2. Soil Sample + 10% foundry sand

Table -2:

Water Content	0.14	0.189	0.26	0.33	0.358
Dry Density	1.46	1.614	1.536	1.4	1.35

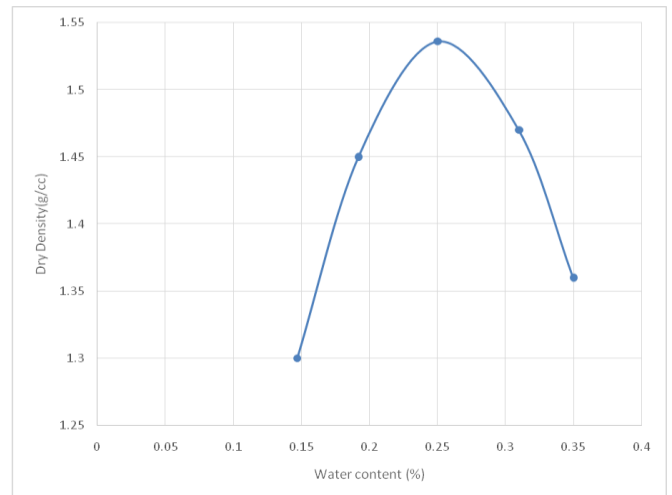


Graph -2: water content vs Dry Density

2.3. Soil+ 10% Foundry Sand+ 5% Rice husk ash

Table -3:

Water content	0.147	0.192	0.25	0.31	0.35
Dry Density	1.3	1.45	1.536	1.47	1.36

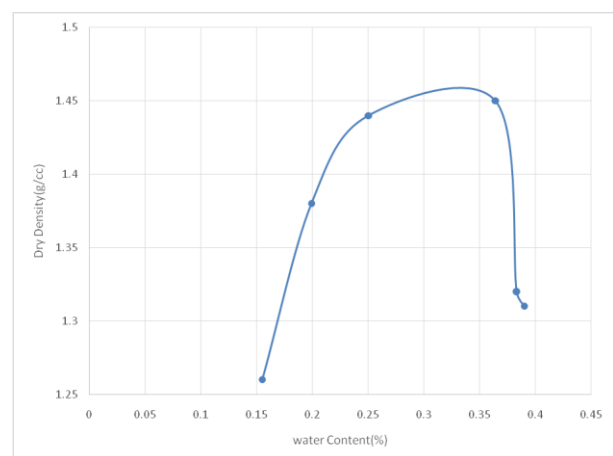


Graph -3: water content vs Dry Density

2.4. Soil Sample+10% Foundry sand+ 10% Rice husk Ash

Table -4:

Water Content	0.155	0.199	0.25	0.364	0.383	0.39
Dry Density	1.26	1.38	1.44	1.45	1.32	1.31

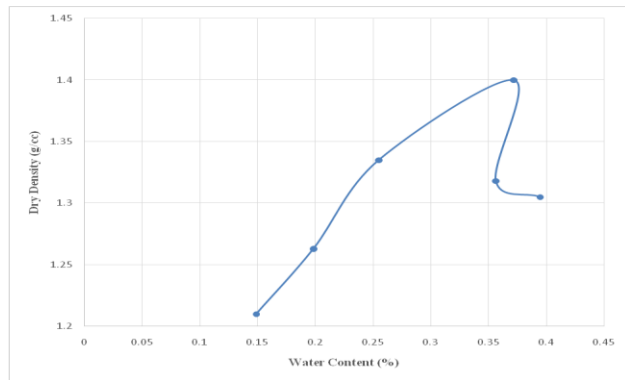


Graph -4: water content vs Dry Density

2.5. Soil Sample+10% Foundry sand+ 15% Rice husk Ash

Table -5:

Water content	0.149	0.1985	0.255	0.372	0.3565	0.395
Dry Density	1.21	1.263	1.335	1.4	1.318	1.305

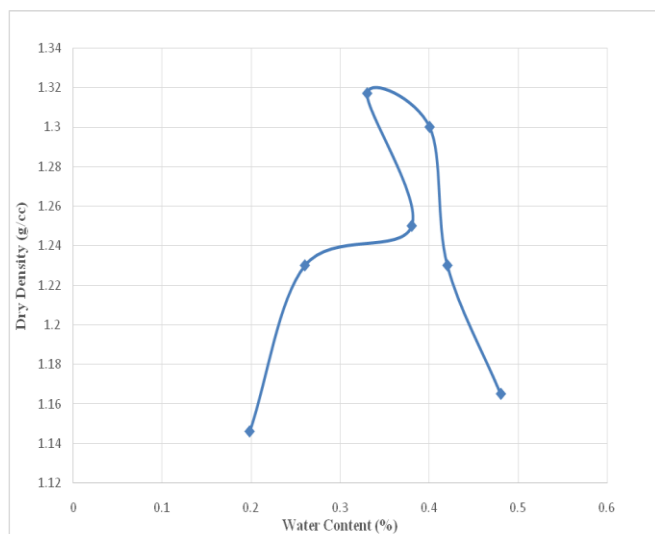


Graph -5:water content vs Dry Density

2.6. Soil+10% Foundry sand + 20% Rice Husk Ash

Table -6:

Water content	0.198	0.26	0.38	0.33	0.4	0.42	0.48
Dry Density	1.146	1.23	1.25	1.317	1.3	1.23	1.165



Graph -6: Water content vs Dry Density

Table -6: Optimum Moisture Content (OMC) And Maximum Dry Density(MDD)

SAMPLE	OPTIMUM MOISTURE CONTENT(%) (OMC)	MAXIMUM DRY DENSITY(g/cc) (MDD)
Soil	25.00	1.61
Soil + 10% Foundry Sand	26.00	1.536
Soil + 10% Foundry Sand + 5 % Rice husk ash	31.00	1.47
Soil + 10% Foundry Sand + 10 % Rice husk ash	36.40	1.45
Soil + 10% Foundry Sand + 15 % Rice husk ash	37.20	1.43
Soil + 10% Foundry Sand + 20 % Rice husk ash	38.00	1.25

3. CONCLUSIONS

1. The percentages of foundry sand and RHA increases with increase in OMC of soil
2. The percentages of foundry sand and RHA increase MDD of soil decreases.
3. Silica present in RHA is capable to replace the exchangeable ion present in clay mineral thus can reduce shrinkage and swelling property of clay minerals.
4. All round improvement of soil's engineering properties with addition of foundry waste and RHA shows that foundry waste sand and RHA is a very good waste material for soil stabilization.
5. Foundry sand and RHA is waste which can be used as soil stabilizer.

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