SOIL STABILIZATION OF CLAYEY SOIL USING RICE HUSK ASH

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Abstract : It has become an utmost important to make soil fit to bear the heavy load coming from modern infrastructures and highways,. All the pre available soils, sometimes, are not fit to withstand heavy loads as they have weak strength due to more cohesion/ swelling properties or very densely packed particles. Therefore, the exploration of soil properties before and after its stabilization is needed. In current experimental program, raw soil was collected and its stabilization was carried out with the help of rice husk ash and PP fibres. Various strength and other engineering parameters were determined in laboratory but only phys ical properties of RHA and PP fibres were explored during this study. Therefore, from the various results obtained from different laboratory tests, it is concluded that the optimum percentage of RHA and PP fibres are 9% and 0.2% respectively as at this proportions best results were attained. So, it is highly recommended that 9% Rice husk ash and 0.2% PP fibres of waste materials by dry weight of soil should be utilized for enhancing the different properties of raw soil.

IndexTerms - **Soil Stabilization, Rice Husk, Polypropylene fibres.**

INTRODUCTION

Soil Stabilization is the process which alters the soil in order to improve their physical properties and gives stability. This process can enhance the shear strength of a soil and/or control the shrink-swell properties of a soil i.e. compaction or consolidation, which ultimately improves the load bearing capacity of a sub-grade which easily support pavements and foundations. Soil Stabilization process may be used for construction of roadways, parking areas, projects which entails development of site, runways or terminals for airports and any other similar situations where sub-soils are not feasible for erection of structure. Stabilization process is being used to treat the wide range of sub-grade soils, which varies from expansive clays to granular materials.

Rice husk ash (RHA) is a waste and end product of rice milling industry. It is used as a soil stabilizer or as a replacement to cement, is an alternative to the final disposition with environmental benefits. Due to its non-self- cementitious properties, a hydraulic binder like a lime or cement must be added to form cementitious slurry in order to improve the soil strength.

Researches on stabilization by the application of RHA and cementitious material combinations were conducted in various kinds of soils.

The polypropylene is a 100% synthetic fibre which is made from 85% propylene as the monomer of PP is propylene and it is the end product of petroleum. Polypropylene chips are transformed to polypropylene PP fibres with the help of melt spinning. It's a traditional method. Structurally, PP fibres are composed of crystalline and non-crystalline regions. The fibres are available in different sizes ranging from just a fraction of millimetre to centimetres in diameter.

OBJECTIVES OF THE STUDY

1. To study the geotechnical properties of the soil sample collected from the site.
2. To stabilize the soil by using Rice Husk Ash at proportion of 3%, 6% and 9% and PP fibres at varying proportion of 0.1%, 0.2% and 0.3%.
3. To study the change in properties like OMC, Dry density, CBR with different proportions of Rice Husk & PP Fibers.
4. To analysis and compare the obtained results and suggest the optimum percentage of Rice Husk Ash and PP fibres for stabilizing the soil.

RESULTS

Various outcomes of different tests conducted on raw soil recovered from the soil have been represented in tabular form given below:

Table 1: Results of Tests Carried Out on Raw Soil Sample

S. No.	Test Name	Parameters Determined (Value)			
1	tion of Atterberg Limits	Liquid Limit	37.2%	Plastic Limit	26.61%
2	ard Proctor Test Apparatus	(MDD)	1.95g/cc	(OMC)	15%
3	Direct Shear Test	Cohesion Factor (c)	0.715 Kg/cm2	Angle of Internal Friction (φ)	8° 2'
4	Plasticity of Soil	Plasticity Index(PI)		10.59	
5	C.B.R value			3.8%	
6	Percentage Finer			51.5%	
7	Type of Soil			CI	
8	Specific Gravity			2.68	

CBR Test Results

The final results of CBR Test performed on raw and stabilized soil are represented in the following table.

Table 3: CBR values of various soil samples.

Sr. No.	Soil Type	CBR %
1.	Untreated Soil	3.79
2.	Soil with 3% RHA	4.24
3.	Soil with 6% RHA	4.61
4.	Soil with 9% RHA	5.28
5.	% RHA + 0.1% PP Fibres	5.61
6.	% RHA + 0.2% PP Fibres	7.49
7.	% RHA + 0.3% PP Fibres	6.95

From the above table, it can be concluded by scrutinizing the results of CBR test, Soil with 9% RHA + 0.2% PP Fibres gives the maximum CBR value of 7.49%.

CONCLUSION

The main objective of this research work was to study the effect of adding RICE HUSK ASH on the engineering properties of soil sample. Extensive experimental work was carried out on the engineering properties of the test soil. Major changes were observed in some of the engineering properties of the test soil on the addition of RICE HUSK ASH.

Summary:

SI. NO	SOIL+ % OF RHA	OMC (In %)	MDD (in g/cc)	LIQUID LIMIT (%)	CBR	
					AT 2.5 MM PENETRATION (%)	AT 5 MM PENETRATION (%)
1	0	16.61	1.766	50.20	1.896	1.814
2	5	18.12	1.633	47.60	2.144	2.129
3	10	20.18	1.573	46.08	2.617	2.445
4	15	22.05	1.45	42.95	2.144	2.033
5	20	24.02	1.36	39.60	-	-

1. The addition of RICE HUSK ASH alone to the test soil resulted in decrease in the value of liquid limit.
2. The addition of RICE HUSK ASH alone to the test soil resulted in decrease in the value of MDD.
3. The addition of RICE HUSK ASH alone to the test soil resulted in OMC increase.
4. 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.
   The addition of RICE HUSK ASH alone to the test soil resulted in first increase in CBR Value thereafter it decreases towards the end.

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