An Experimental study on Stabilization of Expansive Soil For Road Sub-Grade By Use of Sugarcane Ash

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Abstract- *Roads are the backbone for the development of any country. Now day's good quality of roads like Expressway, National highway, state highway etc. has been constructing in our country. These networks of roads are providing speed in development. The study of advance construction materials a highway engineer tries to achieve these requirements by numbers of laboratory tests and finalize the best result obtained. This study tries to identify to achieve best strength in subgrade soil with use of Sugarcane Ash and Chemical Additives materials which is available for construction of roads.*

Keywords- Subgrade soil, Sugarcane Ash, Chemical Additives

I. INTRODUCTION

An economy of country is dependent upon many factors, among which transportation network is one of the main factors. For a country to be stable and developed it needs a good, safe, economic and efficient transportation network. Transportation network may consist of mode of transportations such as railways, roadways, airways and waterways. Among all the modes of transportation, roadways is one of the most commonly used mode in daily life as it provides door to door service from origin to destination for passengers or freight.

Soil Stabilization is the alteration of one or more properties of one or more soil properties by mechanical or chemical means, to create an improved soil material possessing the desired engineering properties. Soils may be stabilized to increase strength and durability or to prevent erosion and dust generation.

Requirements of a pavement

1. Sufficient thickness to distribute the wheel load stresses to a safe value on the sub-grade soil,
2. Structurally strong to withstand all types of stresses imposed upon it,
3. Adequate coefficient of friction to prevent skidding of vehicles,
4. Smooth surface to provide comfort to road users even at high speed,
5. Produce least noise from moving vehicles,
6. Dust proof surface so that traffic safety is not impaired by reducing visibility,

The aim of the study is to check the usability of sugarcane ash and chemical additives in stabilization of the locally available expansive sub-grade soil by conducting various laboratory tests.

II. OBJECTIVE OF THE STUDY

1. To study the geotechnical properties of soil before and after addition of the sugarcane ash and chemical additive in suitable dosages.
2. To carry out the flexible pavement design for subgrade soil before and after addition of the sugarcane ash and additive in suitable dosages.

A. Material use in the study

The Sugarcane Bagasse is the fibrous waste produced after the extraction of the sugar juice from cane mills. Bagasse ash is the residue obtained from the incineration of bagasse in sugar producing factories.

Fig.1:Sugarcane ash

The sugarcane bagasse consists of approximately 50% of cellulose, 25% of hemicellulose and 25% of lignin.

Each ton of sugarcane generates approximately 26% of bagasse (at a moisture content of 50%) and 0.62% of residual ash. The residue after combustion presents a chemical composition dominates by silicon dioxide (SiO2). In spite of being a material of hard degradation and that presents few nutrients, the ash is used on the farms as a fertilizer in the sugarcane harvests.

III. LITERATURE REVIEW

Prakash Chavan and Dr.M.S.Nagakumar, from the results, it was observed that the basic tests carried out proved significant after the addition of Bagasse Ash. Furthermore California bearing ratio (CBR) value improved from 1.16% to 6.8 %. And the unconfined compressive strength of specimens increased from 93KN/m^2 to 429 KN/m.

P.A.Sivasubramani, C.Arya, R.Karunya, This study evaluates the potential of Bagasse Ash (BA) and Egg Shell Powder (ESP) to stabilize soft and expansive soil. The physical properties of clay, BA and ESP have been studied by conducting Specific gravity, wet sieve analysis, Liquid Limit (wL) and Plastic Limit (wP) tests. The soil has been classified as Clay of Medium Compressibility (CI). Light Compaction Test (LCT) has been carried out to determine the Optimum Moisture Content (OMC) of virgin soil.

IV. RESULTS & DISCUSSIONS

The results obtained from a series of consistency tests, free swell index tests, compaction tests, CBR tests, UCS tests & shear tests conducted on expansive soils with and without additives have been presented in this chapter in the form of tables and figures.

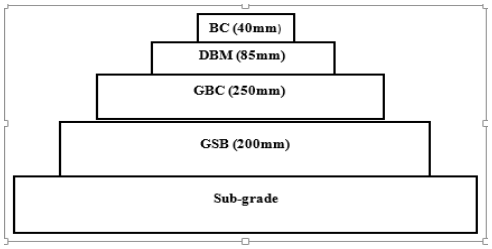
Table 1:-California bearing ratio for various mixtures

Nature of sample	Sample – 1 Soaked CBR (%)	Sample – 2 Soaked CBR (%)
70% soil + 30% bagasse ash	8.16	11.40
70% soil + 30% bagasse ash+ D1	11.9	14.52
70% soil + 30% bagasse ash+ D2	14.39	19.65
70% soil + 30% bagasse ash+ D3	18.91	23.34
70% soil + 30% bagasse ash+ D4	21.64	28.33
70% soil + 30% bagasse ash+ D5	21.47	29.60

V. FINDINGS FROM THE STUDY

Two samples were collected from two different locations but in initial testing it was found that sample 1 is having low properties. Therefore sample 1 had been chosen as designing purpose.

The soil-1 is classified as highly compressible clay (CH) as per IS: 1498 – 1970. The mean grain size (D50) of the soil is found to be 0.0055 mm. The specific gravity of bagasse ash is 2.48. The bagasse ash specific gravity is less than both soil samples.



VI. CONCLUSION

From the test results it is found that liquid limit of soil mixture reduced with increase in bagasse ash replacement and plastic limit of soil mixture increases with in bagasse ash replacement.

CBR for normal soil was 3.61% for normal soil and with addition of baggase ash it gets increased to 8.16%.Cost without stabilization for two lane 1 Km road is INR 12683440/- and with replacement it reduced to INR 10485300/-

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