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Economy of Design of a Carriageway with Varying Sub grade Strength

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ABSTRACT

High cost of traditional stabilizer like bitumen, lime, cement etc. has led to investigation of locally available waste material to stabilized the clayey soil. In this paper investigation is done to assess the usefulness of agricultural industry waste as a stabilizer to stabilized the clayey soil and focused study the effect in strength of clayey soil. Sugarcane Bagasse Ash and Rice Husk Ash which are the waste product obtained from sugarcane industry and rice mills are used as stabilizer to stabilized clayey soil asthey possess pozzolanic properties. Treatment of clayey soil using sugarcane bagasse ash and rice husk ash is very simple, economical and pollution controlling which solves the problem of their disposal up to certain extent. Sugarcane bagasse ash and Rice husk ash were mixed in different percentages with parent clayey soil and various geotechnical characteristics were investigated through standard proctor

test and unconfined compression test. Result shows that there is significant effect on geotechnical characteristics of clayey soil due to addition of sugarcane bagasse ash and rice husk

ash which shows effectiveness of these agro-industry wastesin stabilizing the clayey soil and encourages their bulk utilization.

I.INTRODUCTION

Soil can be defined as the upper layer of earth consisting of air, water and solid particles which is

generally produced by disintegration of rocks. It is the basic and cheapest construction material available in the most part of the country. It supports the load coming over it due to the construction of superstructure and in case of roads supports the base and sub base course in form of soil subgrade. Although it the cheapest and easily available material but its properties vary from point to point across the country specially in case of clayey soils. They cause great engineering problems due to high compressibility, water holding capacity, low strength, low bearing capacity and being active in nature (specially clay with montmorillonite mineral). Due to all these problems the exiting soil at a particular location may not be suitable for the construction and offers problem in construction of pavements, embankments, foundations and many other structures. So it is very necessary to treat these soils[1]. There is a need to concentrate on some cost effective methods for improving the certain engineering and index properties of poor soil. These properties can be improved by the process of soil stabilization using different type of

stabilizer. Stabilized soil proves to be very useful construction material especially if locally available industrial or natural material is used as it will be cost effective also.

India is a developing country in which urbanization and industrial development mainly concentrate on construction techniques of railways, highways, airports, residential building and many more construction. Soil is the cheapest locally available construction material in most

of the part of country. For all construction work we need good soil condition for foundation, embankment, pavements etc. stabilized soil proves to be extremely useful material for all types of construction[5]. As clay exhibit undesirable engineering properties, they tend to have low shear strength and their shear strength decreases further upon wetting or due to some other physical disturbances. Clayey soils are normally associated with volumetric changes when they are subjected to change in water content because of seasonal water fluctuations.

Some clayey soil undergoes much expansion and shrinkage due to wetting and drying which is one of the most undesirable features. Clay develops large lateral pressure and they tend to have low value of modulus of resilience. Furthermore, problems of high compressibility can cause severe damage to civil engineering construction. Therefore, these soil must be treated before commencing the construction operation to achieve desired properties. Several methods of stabilization using conventional materials like lime, bitumen, cement etc. have been developed and used successfully in practice. They have been applied in variety of civil engineering problem but over the year either the availability of these conventional materials has not been sufficient to meet the demand of growing population or they prove to too expansive as fund limited to a particular construction work is limited especially in the newly growing country like India. So, it

become the need of time to find some alternative material which can successfully replace the conventional materials without compromising the engineering performance of the structure. The main objective of this paper is to investigate the potential of using agricultural based industry waste in the field of geotechnical engineering. A lot of research has been done for the stabilization of clayey soil using Sugarcane Bagasse Ash or Rice Husk Ash individually. But soil stabilization using combination of these two i.e. Sugarcane Bagasse Ash and Rice Husk Ash is relatively a new method and very few literature is available related to this topic.

A. Soil

Clayey soil was collected from the field of Samani village district Kurukshetra from the depth of 0.3 to 0.5m below the ground surface and thoroughly hand sorted to eliminate vegetative matter and pebbles. Soil sample was sieved through 4.75 mm sieve for the removal of gravel fraction. Soil was oven dried for 24 hours before investigation its properties as per various Indian Standard codes.

TABLE 1: ENGINEERING PROPERTIES INVESTIGATED

S. No.	Property	Typical Value
1	I.S. classification	CI

2	Plastic limit	23
3	Liquid limit	56
4	Plasticity index	33
5	MDD, gm/cc	1.6
6	OMC %	26.32
7	Specific gravity	2.55

B. Sugarcane Bagasse Ash

Sugarcane Bagasse Ash is basically organic waste obtained as an end product of burning of bagasse in sugarcane factories for the generation of steam. This Sugarcane Bagasse Ash is very rich in oxides of aluminum and silica which can be utilized as stabilizer to stabilized soils. The Bagasse Ash used in the study was collected from The Shahabad Co-operative Sugar Mill Ltd.

Shahabad Markanda of District Kurukshetra. It appears to be black in colour on visual inspection and in fibrous form.

C. Rice Husk Ash

Itis the residual product obtained from the burning of rice husk. This Rice Husk Ash is very good super pozzolona as it contains good amount of amorphous silica which can be used as stabilizer to enhance the properties of clayey soil. In the present study Rice Husk Ash was collected from Kohinoor Foods Ltd. near Sonipat, Haryana. Chemical composition of rice husk varies fromplace to place. This difference is due to change in climate and geographical condition. However, it contains around 85-90% of amorphous silica. Using sugarcane Bagasse Ash and Rice Husk Ash as soil stabilizer will also solve the problem of their disposal. As when bagasse ash is kept in open it ferments and decays, which when inhaled in large doses can result in respiratory disease known as bagassosis. Rice husk ash also contributes to environmental pollution so it would be beneficial to the environment to recycle the waste to produce eco-material having high end value.

II.CONCLUSION

Based upon the finding of the present investigation, the following conclusions can be drawn:

 With increase in SBA and RHA content, the maximum dry density (MDD) of soil decreases and there is increase in optimum moisture content (OMC).

 UCS of soil varies with change in SBA and RHA content. Maximum UCS is achieved when SBA and RHA was 10% each.

 The strength of soil increases up to 2.2612 kg/mm2 as shown in figure-2. This strength is better than parent soil strength (i.e. 1.4121 kg/mm2).

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