

Soil Stabilization using Waste Cotton Clothes Coated with Bitumen

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ABSTRACT

Properties of soil can be enhanced by using different stabilization techniques. Cotton clothes have a high tensile strength as compare to natural fibers. In this study waste cotton clothes coated with bitumen were used for stabilization of soil. As waste cotton clothes are cost effective and eco-friendly, they can be modified and used as effective reinforcement material/stabilizer. Experiment was carried out by adding 1% and 2% of waste cotton cloth coated with bitumen to improve its strength characteristics.

Keywords-- Cotton Clothes, Optimum Moisture Content, Maximum Dry Density, Strength Characteristics

characteristics. It can be enhance by using different techniques. By seeing the properties of soil it can be classified as Poorly graded silty clay.

Table 1: Properties of soil

Properties	Result
Moisture content	23.84 %
Sieve analysis	Cu = 13.33 & Cc = 3.33
Liquid limit test	L.L = 62.5%
Plastic limit test	P.L =28.72 %
Field density	2.20 g/cc
Plasticity Index	33.78

I. INTRODUCTION

Some soil has low strength characteristics; we need to stabilize the soil to make it suitable for construction work. Waste cotton clothes are cost effective and eco-friendly. The study is carried out to evaluate the effectiveness of waste cotton clothes and bitumen on the strength enhancement of soil. Various researches are carried out on soil stabilization techniques and it is emerging as a popular and cost effective method to improve soil properties. In this study waste cotton clothes coated with bitumen are used. We used waste cotton clothes and bitumen at 1% and 2% level.

Materials Used

i) Waste Cotton Clothes

Cotton clothes are the waste which comes from different house hold chores and the stitching shops and the clothes industries where the Clothes like shirts, pants, Kurta, Sarees etc., Clothes are good stabilizers but if we use them for longer duration as reinforcement material then chance of biodegradable activity will be more. So, to avoid such action it is coated with bitumen. And an attempt is made to increase its effectiveness in our project.

ii) Soil Sample

The soil which we have taken in our experimental work is from local area of Palghar district from the backyard of St John College of Engineering and management. As we all know Black cotton soil shows lesser strength parameters and high swelling and shrinkage

iii) Bitumen

Bitumen, a substance known for its waterproofing and adhesive properties, can be formed through the distillation of crude oil. It is composed of complex hydrocarbons and contains elements such as calcium, iron, sulfur, and hydrogen. Here, in our experimental work Bitumen used to maintain the high swelling and shrinkage properties of soil under controlled condition as an adhesive member. When it is coated to waste cotton clothes it increases the cohesive nature of the soil and renders it resistant to the action of water.

II. METHODOLOGY

After knowing all the basic properties of the soil, to enhance the stability of soil it is compacted with cotton clothes coated with bitumen. Waste cotton is coated with bitumen by dipping it in melted bitumen and dried in open air. Cotton cloth coated with bitumen is cut into pieces of different sizes like 2*1 inch, 3*1 inch and 4*1 inch. The prepared stabilizer is added with the soil in different percentages (1% and 2%) to get improved soil compaction parameters. In this experimental work an effort is made to reduce the thickness of pavement by improving CBR value.



Figure 1: Melting of Bitumen



Figure 2: Cotton cloth coated with bitumen

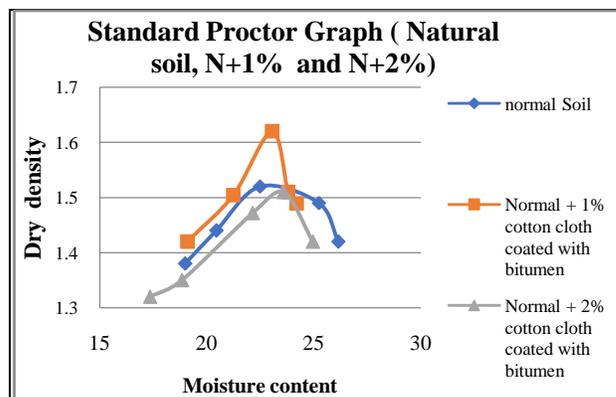


Figure 3: Performing Standard proctor test

Table 2: Standard proctor resultant value

Soil Sample	Optimum Moisture Content (%)	Maximum Dry Density (gm/cc)
Normal soil sample.	22.49	1.52
Soil sample + 1% cotton clothes coated with bitumen.	23.05	1.62
Soil sample + 2% cotton clothes coated with bitumen.	23.59	1.51

Figure 3: Standard proctor graph showing resultant value



From the above observation “Soil sample + 1% of cotton clothes coated with bitumen” gives the higher compaction parameters.

Table 3: CBR resultant value

Soil Sample	CBR @ 2.5 mm penetration (%)	CBR @ 5 mm penetration (%)
Normal soil sample	3.36	2.94
Soil sample + 1% cotton clothes and bitumen.	4.56	3.25

By the addition of 1% waste cotton clothes coated with bitumen CBR value increased by 35.7 %. It indicates that by improving CBR value we can reduce pavement thickness.

III. CONCLUSION

Earlier studies were mainly concentrated on different types of soil stabilization Materials and only some studies were conducted on waste clothes. In the

present work 'waste cotton clothes and bitumen' are used. From the above experimental study we concluded that, we can stabilize the soil with the help of waste cotton clothes coated with bitumen to improve compaction properties.

At a 1% mix of waste cotton clothes coated with bitumen in the soil sample we get a high value of OMC, MDD, and CBR as compare to normal soil sample. By the addition of 1% waste cotton clothes coated with bitumen CBR value increased by 35.7%. It indicates that by improving CBR value we can reduce pavement thickness.

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