SOIL STABILIZATION USING WASTE CRUMB RUBBER TIRE

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Abstract: Crumb rubber tire is quite easily available and is very low in cost, due to day by day increase in cost of stabilizers like cement, lime and other ad mixers use of crumb rubber tire can result in project completion optimally. The soil sample used is clay which requires to be strengthened due to presence of high plasticity; this soil sample is strengthened by using varying proportion of crumb rubber tire. Various tests were conducted to analyze the effect of crumb rubber tire on optimum moisture content, maximum dry density and California bearing ratio. Results shows decrease in optimum moisture content but decrease in maximum dry density, Along with increase in California bearing ratio, from the observations it can be seen that 2%, 4%, 6%, 8% and 10% results in maximum improvement in desired soil properties. The One of chances to dispose of this waste material is to use these refuses, as a stabilizer in soils, in order to increase the strength properties and the bearing capacity of the soil-stabilizer mix. Discarded tire are becoming globally problematic because recycling them may cause environment related problem. Thus, making use of them needs to be considered and solution must be sustainable. Crumb rubber should cover social, environmental, and economic sustainability. Now days the waste tire are increasingly being considered as construction material. The study was shown clay soil-crumb rubber of 10% stabilization can be used as fill material in sub grade of highway construction.

***Index Terms*- Waste Crumb Rubber Tire, C.B.R, Optimum moisture content, Maximum dry density, Stabilization.**

I. INTRODUCTION

Civil engineers have to deal with various types of soil some weak, some strong, some soft and some hard soils. Construction has to be done in spite of all these difficulties. The desirable properties of soil are achieved by a technique known as soil stabilization. Soil stabilization includes various methods like proportioning, modifiers, stabilizers, admixtures, water repelling agents, water retaining agents, heat treatment, water proofing agents etc.

This thesis concentrates on obtaining the optimum amount of crumb rubber tire for practical work by observations of effect of crumb rubber tire on engineering properties of soil. However the crumb rubber tire can only is used as a partial replacement of adhesive/ cementious material like cement and lime. It cannot completely take over the cementious material because crumb rubber tires the inherent binding property which is required for long lasting material or durability. Hence while conducting the experiments different amount of crumb rubber tire and its effect on the optimum moisture content, maximum dry density and California bearing ratio was analyzed.

Maximum Improvement was seen in optimum moisture content but the presence of crumb rubber percentage helped in increasing the California bearing ratio value also. Thus, indicating the cost effectiveness of pavement or sub grade.

II. Waste tire Rubber (Indian Scenario):

India being one of the developing countries there has been rapid annual increase in the number of vehicles leading to steady increase in the volume of consumption waste rubber tires year by year, it has been observed that the production of tires and tube has been increased year wise. According to Indian scenario, 112 million discarded tires generated per year. These discarded tires are disposed to landfills, stock fills, or burn off, which causes serious health and ecological problem. The recycling and refuse of these discarded waste tires can only minimize its environmental impacts. Some many attempts have been made for its utilization in content, asphalts pavement, filler material in abutment and highway sub grade construction.

Table 1: Properties of Crumb rubber tire

Constituent	Composition (%)
Ash content %	09-11%
Acetone %	10-12%
Moisture %	0.010%
Carbon black %	22-24%

Specific gravity	1.0-1.5
Hydrocarbon content%	60-65%

Fig.1: Waste Crumb Rubber Tire

III. METHODOLOGY

The laboratory tests were performed first on natural soil which includes Index properties, optimum moisture content and California bearing ratio test. The California bearing ratio tests were conducted on optimum moisture content and maximum dry density.

Later on specimens were made by adding three different percentage of waste crumb rubber tire i.e. 2%, 4%, 6%, 8% and10% along crumb rubber tire in each case to add adequate soil property to the mix.

Material Used in this research work

1. Soil
2. Waste Rubber tire

IV. TEST RESULTS AND DISCUSSION

4.1 Index Properties of Soil

Table 2: Index Properties of Soil

Soil Properties	Test Results
Classification	OI (Organic clay with medium plasticity)
Specific Gravity	2.35
Liquid Limit	39.08%
Plastic Limit	28.83%
Plasticity Index	10.25%
OMC	13.75%
MDD	1.85 g/cc
CBR (Soaked), in %	4.96

4.2 WATER CONTENT VARIATION OF SOIL WHEN MIXED WITH CRUMB RUBBER TIRE

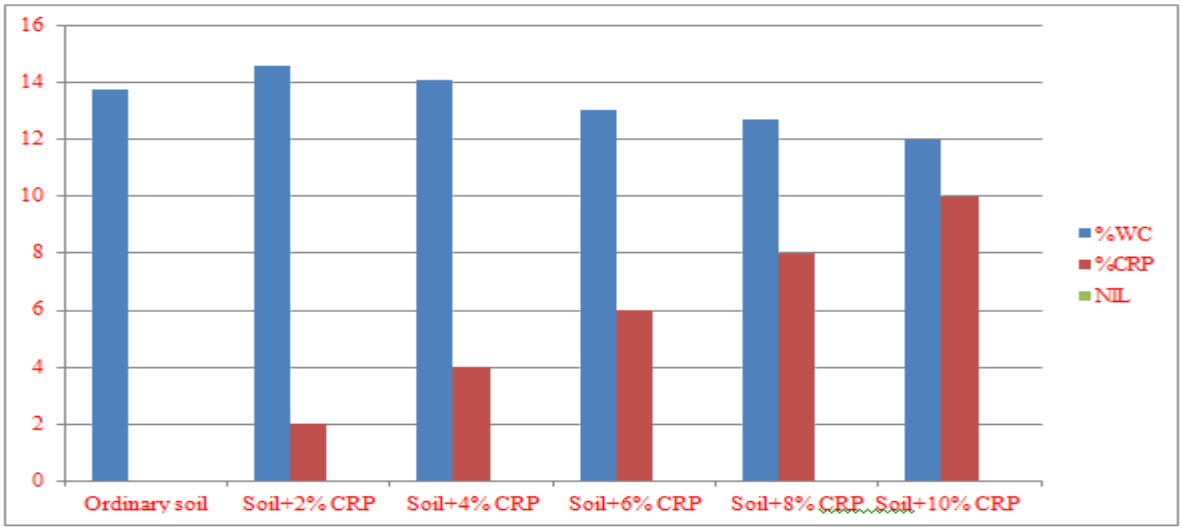

fig.2: comparison graph of water content variation of treated and untreated soil

4.3 DRY DENSITY VARIATION OF SOIL WHEN MIXED WITH CRUMB RUBBER TIRE

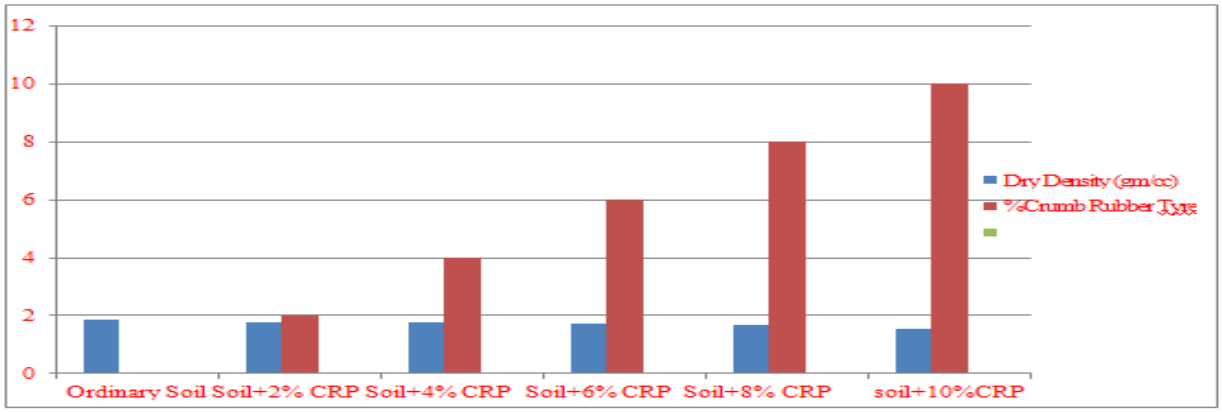

fig.3: comparison graph of dry density variation of treated and untreated soil

4.4 Variation in CBR values with respect to Percent of Waste Crumb Rubber Tire;

Table 3: cbr value of soil mixed with different percentage of crumb rubber tire

Soil + 0% CRP	Soil + 2% CRP	Soil + 4% CRP	Soil + 6% CRP	Soil + 8% CRP	Soil + 10% CRP
4.96	5.04	5.12	5.58	6.25	7.31

4.5 Comparison of Variation of CBR values and Percent of Waste Tire mixed;

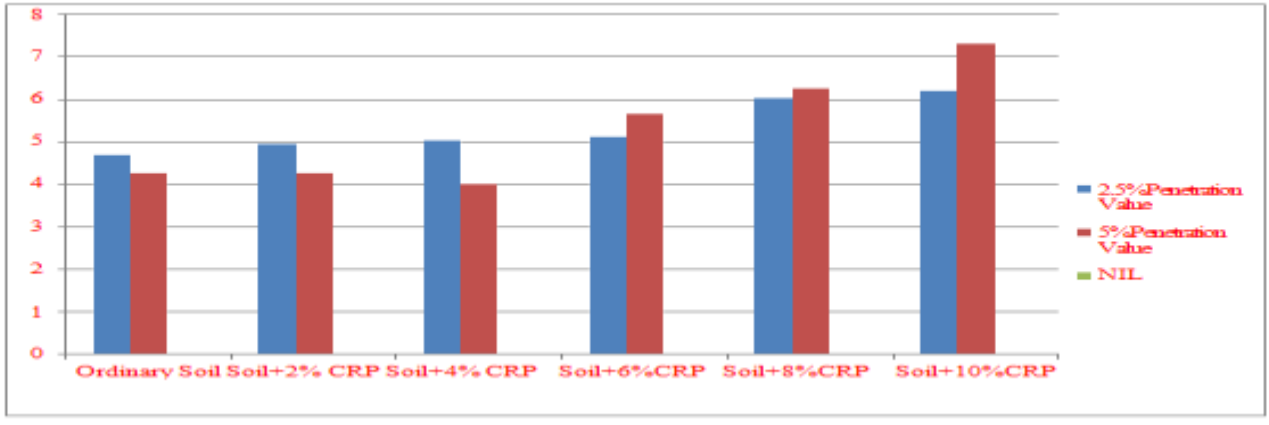

fig.4: comparison graph of CBR value variation of treated and untreated soil

V. CONCLUSION

1) The test results showed that maximum dry density of soil improved and decrease in optimum moisture content with increase in crumb rubber tire content.

2) There was also improvement in the value of un- soaked CBR value of soil in comparison to the natural soil. Soaked CBR also improved.

3) Crumb rubber tire hence it can greatly reduce the overall cost of construction.

4) In general for this particular soil, the properties of soils shows improvement with the use of 10% of crumb rubber tire stabilization with clay soil.

5) Crumb rubber tire can stabilize the soil as it reduces the cost of construction, it is of great use in rural areas of developing countries like India. We can use more than 7% of California bearing ratio percentage value for highway construction of sub grade construction.

VI. Scope of Further Aspect:-

The accumulation of waste material is an important factor to look out for environmentalists. Crumb rubber tire is one of the products generated as tire industry waste. Crumb rubber tire give great pozzolanic properties it can act as a good building material and can be used in pavement construction also. it is mandatory to look for some sort of substitute and crumb rubber tire has major properties that make it an attractive alternative in future.

1) Improving properties of soil have become a matter of paramount importance today. Here an effort has been made to study the effect of crumb rubber powder here are some suggestion made for further researches in the area.
2) Use of crumb rubber tire making the foundation process cheap and comfortable in economically and reduce the cost of construction of highway sub grade construction also.
3) Use of wastages material which is producing in high potential and having disposal problem.
4) Other geotechnical parameters such as hydraulic conductivity, consolidation parameter can be calculated.
5) Durability aspect of crumb rubber treated soil like drying and wetting, freezing and thawing action and response of various chemical like alkalis, chlorides, sulphite may also be investigated.
6) Observe a right connection mixture of the addition component likes crumb rubber powder with soil and Improve geotechnical properties of soil.

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