International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 03, March-2019

UPGRADING THE BEARING CAPACITY OF SALINE SOIL BY USING VITRIFIED POLISH WASTE FOR FLEXIBLE PAVEMENT AS A SUBGRADE MATERIAL

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Abstract- The soil which contains salt is known as SALINE SOIL. These salts occur naturally in soil and water. Salt in soil can also come through some artificial processes like irrigation. Saline soil scattered wide range of Andhra Pradesh. Its presence causes engineering problems, which arising for Structural problems, due to collapse behaviour, when moisturizing with water from any source, due to the rapid melting of the salt molecules surrounding soil granules, leading to the disintegration of the ties of the soil. This study sheds light on the possibility of stabilizing saline soil, mixed with some available additives:(5%, 10%, 15%&20% of Vitrified Polish Waste) and investigates its strength. The soil used in this study was natural saline soil with 10% salinity retrieved from a region near machilipatnam beach. Number of tests was conducted using laboratory models. The best improvement was achieved by adding 10% Vitrified Polish Waste. The CBR value is increased by 37% by adding 10% VPW, when compared with virgin Saline Soil.

KEYWORDS: saline soil stabilization, additives, Vitrified Polish Waste, saline soil, sub grade

I. INTRODUCTION

For any land-based structure, the foundation plays major role and it has to be strong to support the whole structure. In order for the foundation to be strong, the soil around the foundation plays a very difficult role. So, to join with soils, we have proper knowledge about soil properties and factors which affect their behaviour.
In recent times, soil stabilization has started to take a new shape. With the availability of better research, materials and equipment, soil stabilisation is gaining a popular and cost-effective method for the improvement of soil.
The soil which contains salt is known as SALINE SOIL. Saline soils have so many physical changes when compared with normal healthy soils. Saline soils are observed to have low structural stability, infiltration rate, and water holding capacity. The soluble salts are mainly sodium chloride and sodium sulphate, but saline soils also contain some quantities of chlorides and sulphates of calcium and magnesium. Saline soil deposits of Machilipatnam, were used for the testing with the aim to investigate its consolidation and strength characteristics and further make suitable for foundation constructions or sub-grades over it. The soil was collected at 0.5m, depth from the Chilakalapudi area near Machilipatnam, A.P, India and used for the study. The VPW used in this investigation was brought from "VENNAR CERAMICS LIMITED, Kaikuluru."VPW is the waste obtained from manufacturing process of vitrified tiles, which is causing a huge disposal problem. Effective utilisation of this waste in this process like stabilisation also helps in environmental safe guarding.

II. OBJECTIVES OF STUDY

The objectives of the present experiment study are ,
1. To determine properties of saline soil and vitrified polish waste.
2. To evaluate the performance of saline soil when stabilized with vitrified polish waste as an admixture and its suitability for the sub grade.
3.To enhance the engineering properties of saline soil(OMC,MDD,CBR).
4. To upgrading the properties of saline soil for construction of different structures.
5. For consumption of industrial waste and to increase bearing capacity of soil.

III. MATERIALS USED

A. SALINE SOIL:

The soil used for the study was collected at 0.5m-1m below the bed level in Chilakalapudi area near Machilipatnam. The index & engineering properties of the saline soil are determined as per IS code of practice.

B. VITRIFIED POLISH WASTE:

The vitrified polish waste used in this investigation was brought from "VENNAR CERAMICS LIMITED, Kaikuluru. VPW varied in percentages of 5%, 10%, 15% and 20% by weight of SALINE SOIL throughout the experiments.

CHEMICAL COMPOSITION OF VPW:

Table:1

Oxide Composition	Percentage
SiO_2	49.52
Al_2O_3	14.70
CaO	1.40
Fe_2O_3	0.40
MgO	2.45
Na_2O	0.71
K_2O	2.69
P_2O_5	0.05

IV. LABORATORY INVESTIGATION

A. The Physical Properties of vitrified polish waste were presented in tables-1 below. The tests are conducted as per IS 2720 codes of practice.

Table:2

S.No	Experiment name	Result
1	Specific gravity	2.46
2	Liquid limit%	NP
3	Plastic limit%	NP
4	Optimum Moisture Content	1.58
5	Maximum Dry Density	19.4

B. Results of soil sample with different percentages of vpw:

Table:3

S.No	Property	100%soil	95% soil +5%VPW	90%soil +10%VPW	85%soil +15%VPW	80%soil+ 20%VPW
1	Specific gravity	2.026	2.201	**2.227**	2.507	2.598
2	Liquid limit%	NP	NP	**NP**	NP	NP
3	Plastic limit%	NP	NP	**NP**	NP	NP
4	OMC %	19.04	13.63	**8.69**	8.64	8.69
5	MDDg/cc	1.563	1.678	**1.630**	1.636	1.791
6	CBR%	2.895	5.62	**7.80**	7.53	7.51

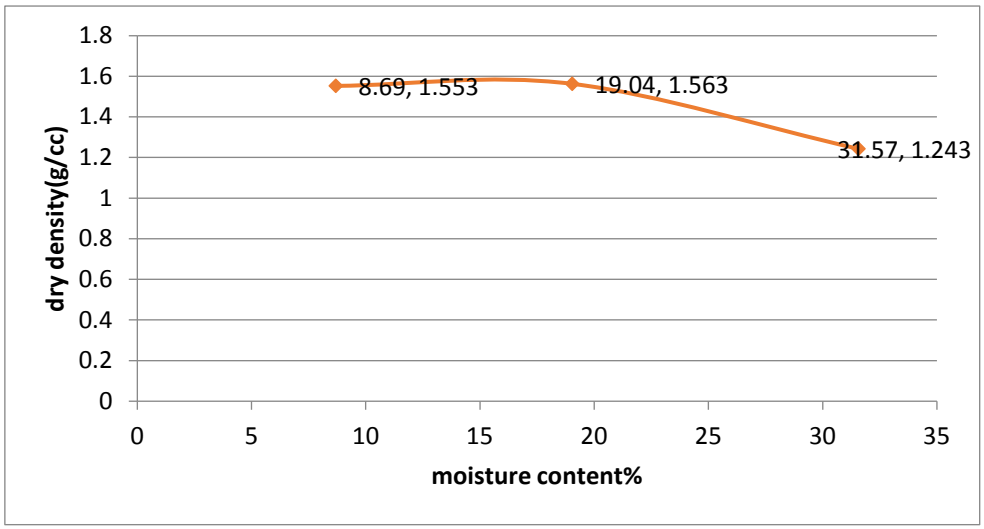

Fig 1. OMC&MDD Values of Untreated Saline Soil

C. Proctor Modified Compaction and CBR test results for Saline Soil treated with Vitrified Polish Waste.

i) Proctor Compaction Test results

Comparison tests were conducted to get the OMC and MDD of the mix of different proportions of the soil, Vitrified Polish Waste using modified proctor compaction test as per IS Codes of Practice(IS:2720 part-6;1974)

ii) OMC and MDD graphs of different percentages of VPW treated with Saline Soil are shown below.

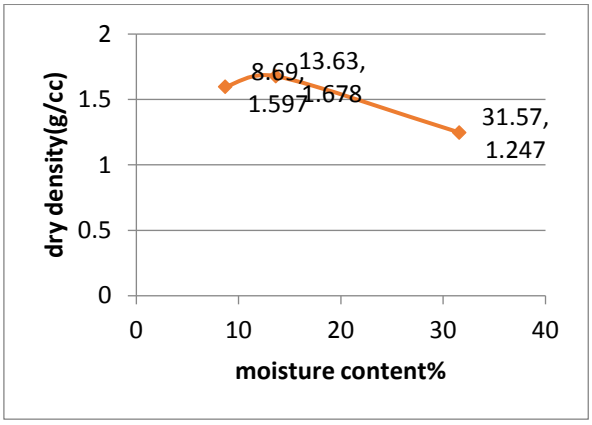

Fig 2. OMC&MDD Values of Saline Soil treated with 5% VPW

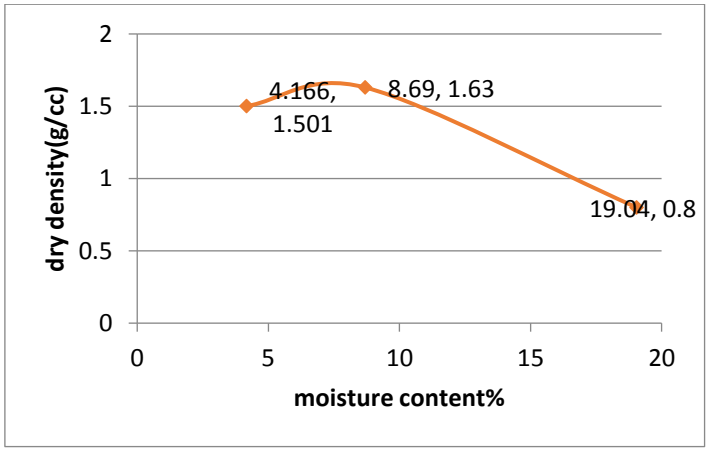

Fig 3. OMC&MDD Values of Saline Soil treated with 10% VPW

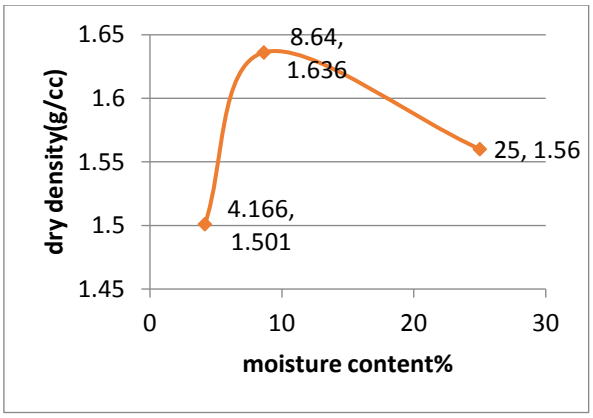

Fig 4. OMC&MDD Values of Saline Soil treated with 15% VPW

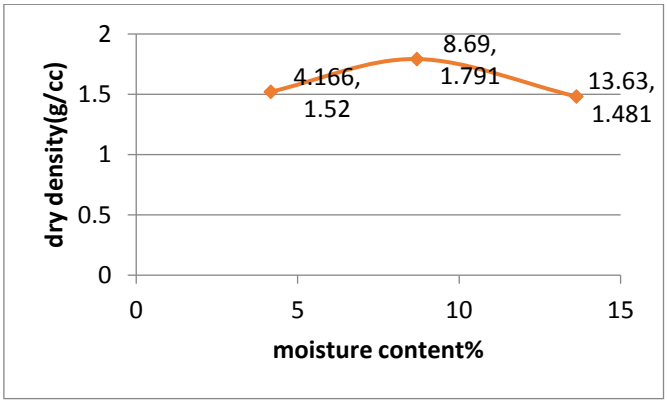

Fig 5. OMC&MDD Values of Saline Soil treated with 20% VPW

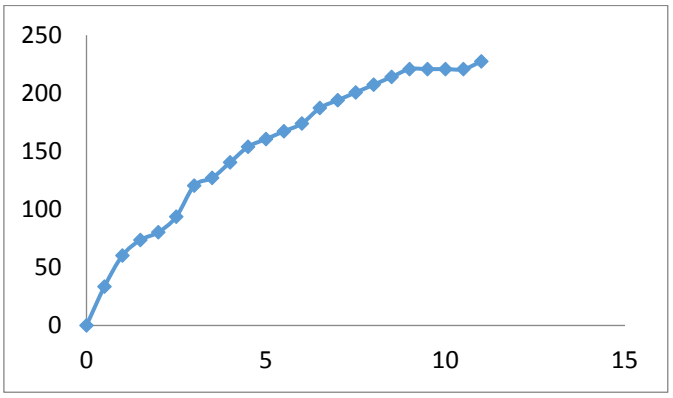

Fig 6. CBR Value of 10%VPW Treated Saline Soil

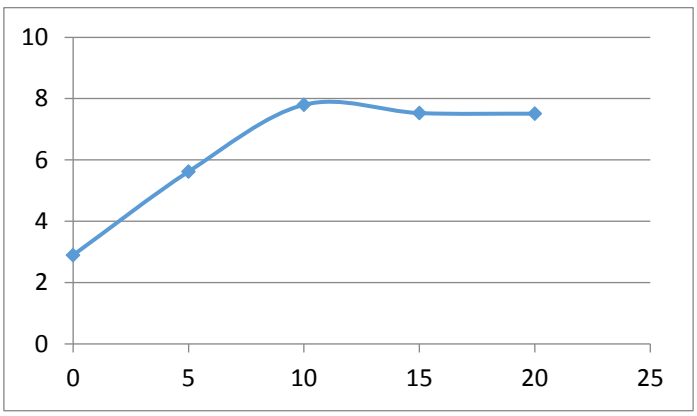

Fig 7. CBR Values of Treated Saline soil with % variation of VPW

V. CONCLUSION

- The best improvement for saline soil was achieved by mixing it with 10%VPW. So it considers the most applicable and effective technique, since this material is available and easy to deal with and the soil stabilized effectively.
- Since Saline Soil is a loose soil and have more silt content Plastic Limit and Liquid Limit is not applicable.
- When Saline Soil is mixed with 10%VPW, The CBR value is increased by 37% when compared with virgin soil

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