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EFFECT OF SOAKING PERIOD ON STRENGTH OF LIME STABILIZED EXPANSIVE SOIL USING RICE HUSK ASH & STONE DUST AS ADDITIVES

K.Nagarjuna*, I.Prasanth Aryabhat
Department Of Civil Engineering, R.V.R & J.C College Of Engineering,Guntur, A.P, India.

ABSTRACT

This research paper presents the relation between the strength and soaking period. Soaking period had a considerable effect on strength of the soil mixture.In this we used rice husk ash and stone dust as additives as they were economical. For the present work effect of soaking on the additives was studied extensively. Rice husk ash and stone dust are added to the soil with varying their content from 2% to 12% at optimum content of lime 8%. Samples were prepared for unconfined compression test and these samples were tested at different soaking periods. (i.e. 7, 14, 28, 56 days of soaking).The results showed that there was a considerable increase in strength from 7 days to 28 days soaking as lime reacts it is expected to reach maximum at 28 days, from then till 56 days increase the strength of the soil is comparatively very less compared with increase in strength for 28 days soaking.

KEYWORDS: Lime stabilization, Stone dust, Rice husk ash (RHA), Strength improvement

INTRODUCTION

Expansive soil is a type of clayey soil having montmorillonite mineral, which expands when comes in contact with water and shrinks when the water evaporates. Rice husk is a major agriculture by product obtained from the food crop paddy. For every 4 tons of rice 1 ton of rice husk is produced. DPT, (2001) suggested that the natural stone production amount was 21.7 million tons in the year of 1986. When the RHA content was increased from 0 to 12%, Unconfined Compressive Stress increased by 97%.Rice hush ash Stone dust is an effective agent for chemical or/and mechanical stabilization of soil. By improving sub grade conditions, promotes cost savings through reduction in the required pavement thickness

EXPERIMENTAL METHODOLOGY

The experiment was done as per IS 2720 PART 10 : 1991, using locally available lime, rice husk ash and stone dust. The physical properties and chemical properties of the materials are stated in below tabular forms. Expansive soil was collected from a depth of 2.0m below the ground level beside highway from Amalapuram, West Godavari district. The liquid limit and plastic lime of soil are stated in tabular form No. 1.

Rice husk as used for study was brought from local available source which was completely burnt at the collection time of material. The physical and chemical properties of the RHA are given in tabular No 3,4 respectively.

The stone dust was collected from local quarry unit which is having specific gravity of 2.77, maximum dry density of 20.1kN/m^3, optimum moisture content of 9.4% and having a silt size of 16%. The gravel size is 3% and sand size is 81%. As per Indian standards the stone dust from its properties of particle size comes under SM.

EXPERIMENTAL DATA

Table1: physical and engineering properties of soil

S NO	PROPERTY	VALUE
1	Specific gravity	1.67
2	Particle size distribution a)sand % b)silt% c)clay%	 24 3.2 72.8
3	Liquid limit	86.27%
4	Plastic limit	36%
5	Is classification of soil	CH

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6	Maximum dry density	14.4
7	Plasticity index	50.27

Table 2: physical and engineering properties of soil

S.No	PROPERTIES	VALUE
1	Specific gravity	2.77
2	Maximum dry density	20.1
3	Particle size distribution Gravel % Silt % Sand %	 3 81 16
4	Optimum moisture content	9.4
5	Is classification	SM

Table 3: physical and engineering properties of RHA

S no	**properties**	**value**
1	Specific gravity	1.95
2	Maximum dry density	7.3
3	Optimum moisture content	70

Table 4: chemical properties of RHA

S no	**constituents**	**Percentages %**
1	Silica – SiO_2	90.23
2	Alumina – Al_2O_3	2.54
3	carbon	2.23
4	Calcium Oxide – CaO	1.18
5	Magnesium Oxide – MgO	0.53
6	Potassium Oxide – KaO	0.39
7	Ferric Oxide -Fe_2O_3	0.21

TABLES AND RESULTS

TABLE 5: Variation of UCS with different soaking periods for different percentages of RHA

RHA	7days	14 days	28days	56days
2%	47.8590	64.5290	79.5857	79.5857
4%	68.9196	82.0471	91.4160	93.5670
6%	91.8928	103.379	107.548	111.850
8%	99.4544	110.504	119.348	122.605
10%	110.504	125.423	131.208	134.435
12%	90.007	107.570	112.925	116.152

TABLE 6: Variation of UCS with different soaking periods for different percentages of stone dust

SD	7days	14days	28days	56days
2%	95.4962	118.033	127.779	131.027
4%	109.026	132.110	138.608	144.022
6%	115.568	141.856	151.602	158.099
8%	131.719	158.099	167.845	175.425
10%	148.276	176.508	187.337	195.458
12%	135.359	158.099	165.138	171.094

Fig 1: UCS stress variation graphs for rice husk ash for 7 days

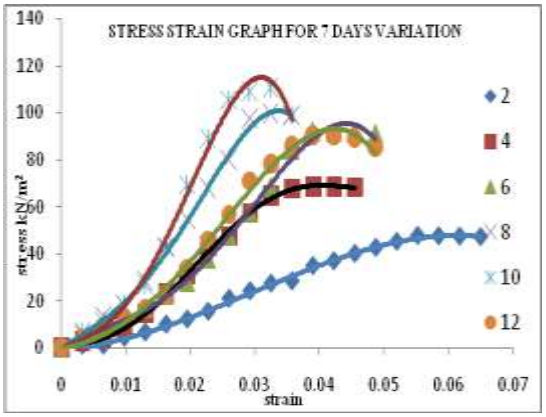

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Fig 2: stress strain graph for 14 days soaking period (RHA)

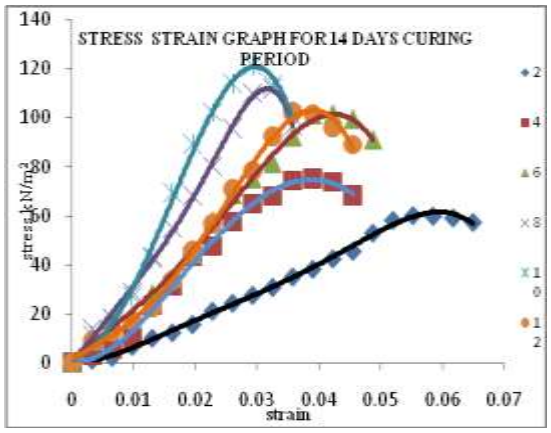

Fig 3: stress strain graph for 28 days soaking period (RHA)

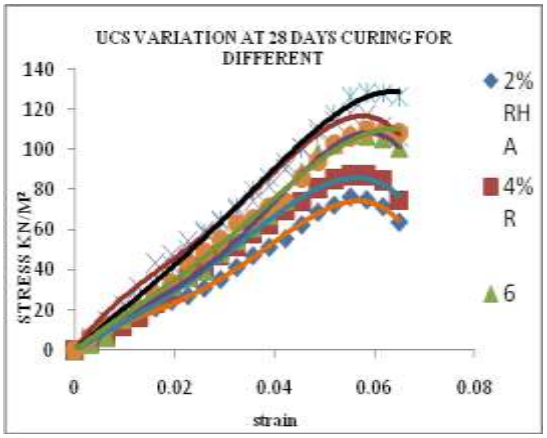

Fig 3: stress strain graph for 56 days soaking period (RHA)

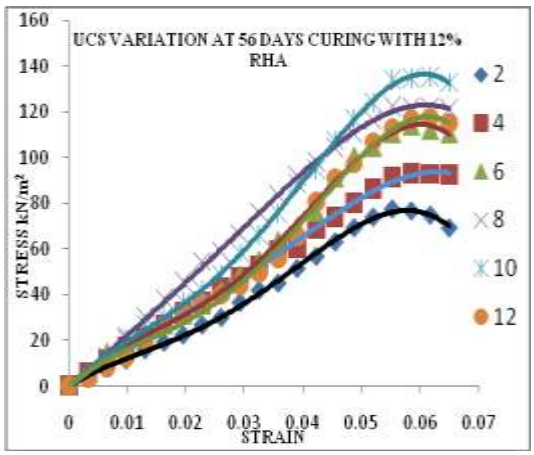

Fig 5: stress strain graph for 7 days soaking period (SD)

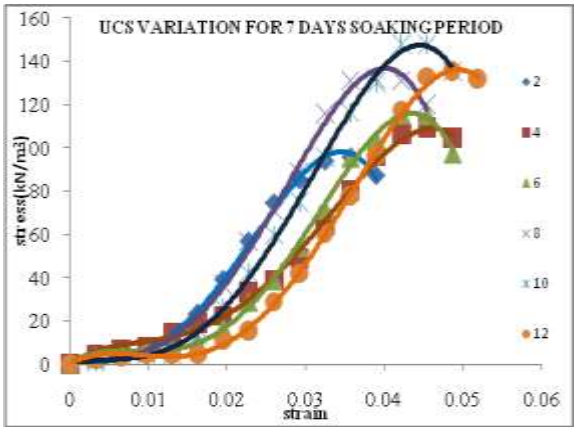

Fig 6: stress strain graph for 14 days soaking period (SD)

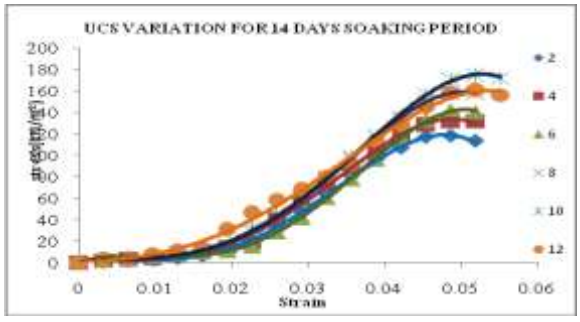

Fig 7: stress strain graph for 28 days soakin period (SD)

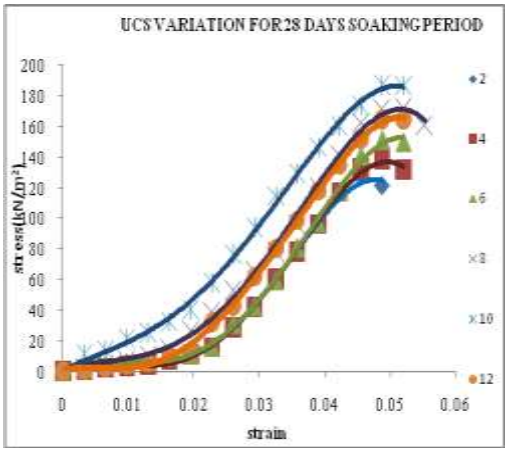

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Fig 8: stress strain graph for 56 days soaking period

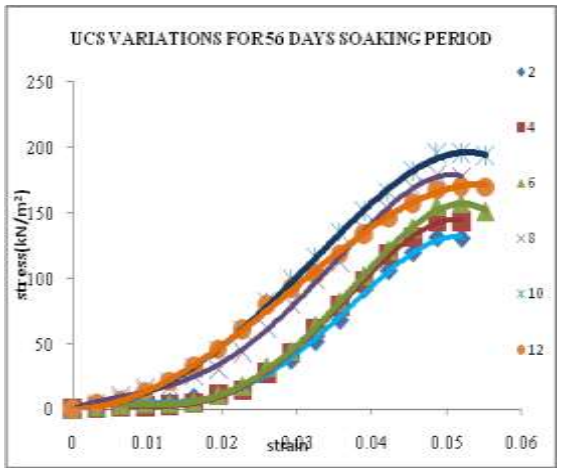


Fig 9: graph of Stress and No of days for RHA

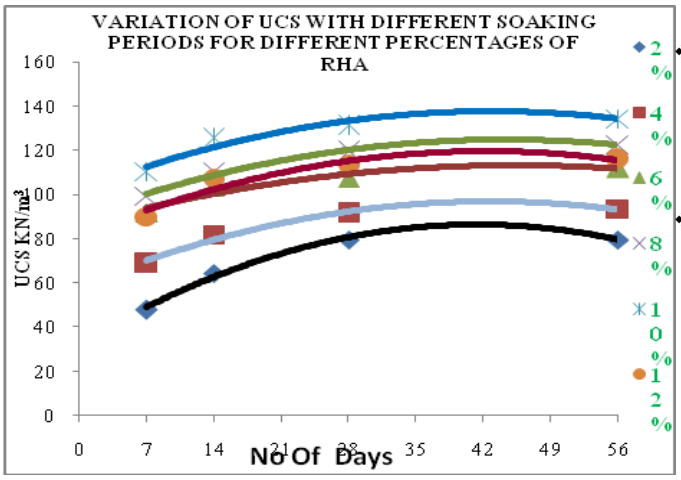
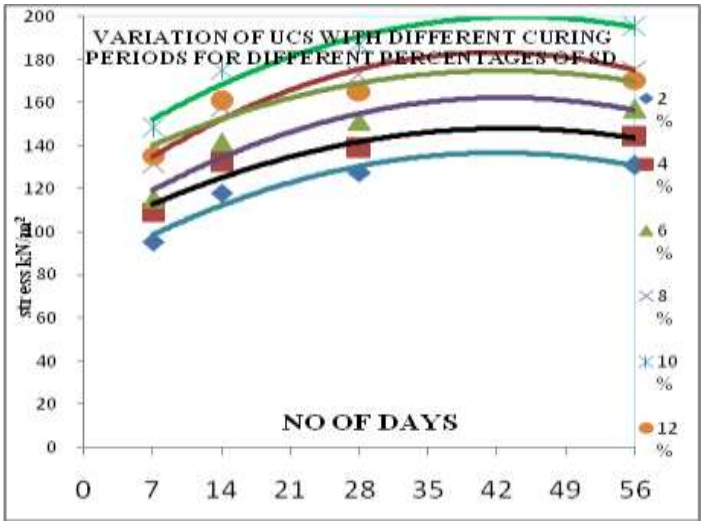


Fig 10: Graph between maximum stress and No of days for SD



CONCLUSIONS

- Soaking period had a considerable effect on strength of the soil mixture.
- Soaking period has a significant effect on development of unconfined compressive strength, when RHA and stone dust are added to lime-stabilized soil.
- For 8% of lime content initial UCS value was 89.21 kN/m^2, on addition of RHA whereas on 7 days soaking it was increased to 110.65 kN/m^2, and on 14 days soaking UCS reached 121.55 kN/m^2, on 28 days soaking it increased to 128.61 kN/m^2, finally at 56 days it was reached to 135.64 kN/m^2 .
- UCS value is increased 24.06% for 7 days, 36.19% for 14 days, 44.17 for 28 days and a total of 52.04% of strength was increased for 56 days soaking.
- For 8% of lime content initial UCS value was 89.21 kN/m^2, on addition of stone dust whereas on 7 days soaking it was increased to 148.27kN/m^2, and on 14 days soaking UCS reached 175.36 kN/m^2, on 28 days soaking it increased to 187.33 kN/m^2, finally at 56 days it was reached to 195.45 kN/m^2 .
- UCS value is increased 89.21% for 7 days, 96.52% for 14 days, 109.99 for 28 days and a

total of 119.09% of strength was increased for 56 days soaking.

- There was a considerable increase in strength from 7 days to 28 days soaking as lime reacts it is expected to reach maximum at 28 days, from then till 56 days increase the strength of the soil is comparatively very less compared with increase in strength for 28 days soaking.

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