BEHAVIOR OF FLYASH WITH DISPOSAL WASTE CARBIDE SLUDGE

Er. Manisha Meena [1] Er. Harshil Bhatt [2] Dr. Ajay Bindlish[3]

[1]Scholar M.Tech. (Geotechnical Engineering), Civil Engineering Dept., UTD, RTU, Kota (India)
[2]Scholar M.Tech. (Geotechnical Engineering), Civil Engineering Dept., UTD, RTU, Kota (India)
[3]Professor, Civil Engineering Dept., UTD, RTU, Kota (India)

ABSTRACT

The flyash collected from Kota Thermal Super Power Station, Kota City, was stabilized using 5%, 10%, 15% and 20% carbide sludge by dry weight of the flyash. The effect of the additives on the flyash was investigated with respect to Atterberg limits, compaction and specific gravity tests.

The results obtained indicate an increase in optimum moisture content (omc) and a decrease in maximum dry density (mdd) and liquid limit of the flyash for all additives. But there was also a tremendous improvement in the mdd value when the flyash is stabilized with a combination of 10-15% carbide sludge and fly ash. This shows a potential of using carbide sludge as admixture in stabilized flyash.

Keywords: *carbide sludge (CS), flyash(FA), liquid limits(LL), mdd, omc.*

I.INTRODUCTION

In India, the thermal power generation constitutes 73% of the total power generation installed capacity. Out of which nearly 90% is coal based power generation. The high ash content (30-50%) of Indian coal is a contributing factor for the huge production of fly ash. Fly ash (FA) generation in India was 112 Mt during 2005 and it is expected to hike between 150 and 170 Mt per year by the end of 2012. Formation of FA depends on the ash content of coal and Indian coal used in power plants generally has very high ash content (35–45%) and is of lower quality. As a consequence, a large amount of FA is generated in thermal power plants, and is disposed off in unmanaged landfills, lagoons and ponds. FA disposal in an unscientific way affects the local ecosystems due to the heavy metal pollution through erosion and leach ate generation. The scenario with respect to fly ash management has undergone considerable improvement over the past few years. Due to increasing dependence on coal as a major resource for energy production and growing environmental concern due to the haphazard of FA disposal, it has become imperative exploring viable avenues for FA management. Hence, the thrust of this discussion was to review the existing FA management options in India and recommend strategies for minimizing the problems related to FA disposal and encouraging its effective utilization. Carbide sludge is also known as lime sludge and hypo sludge. Geotechnical engineers are constantly searching for new and suitable engineering methods for improving the engineering properties flyash. In the developing country like India there is lack of and to dispose the waste that reason engineers are consistently looking for using these waste as stabilizing material.

II.MATERIAL USED –

❖ Expansive Soil: - A soil sample for the present was collected from Kota Super Thermal Power Station Kota, Rajasthan.

Table -2.1 General Properties of Flyash

Parameters	Fly Ash
Bulk Density (gm/cc)	0.9-1.3
Specific Gravity	1.6-2.6
Plasticity	Lower or non-plastic
Shrinkage Limit (Vol stability)	Higher
Grain size	Major fine sand / silt and small per cent c clay size particles
Clay (percent)	Negligible
Free Swell Index	Very low
Classification (Texture)	Sandy silt to silty loam
Water Holding Capacity (WHC) (per cen	40-60
Porosity (per cent)	30-65
Surface Area (m2 / kg)	500-5000
Lime reactivity (MPa)	1-8

.

❖ Carbide Sludge:-A carbide sludge sample was collected from fertilizer production Plant of DCM Shriram Fertilizers, Kota, Rajasthan.

Table -2.2 Chemical Composition of Carbide Sludge

S. No.	Chemical Constituent	Chemical composition (% Carbide Sludge
1	Moisture Content	68.09
2	LOI	24.88

3	Acid Insoluble	0.075
4	Mixed Oxide(R2O3)	2.47
5	Cao	51.66
6	Mgo	0.42
7	Sulphur	2.2

III.EXPERIMENTS AND RESULTS

3.1 **Particle size:**

The dry particle size analysis was performed by sieve as per the Indian standard IS 2720 [123] procedure to determine the grain size distribution of fly ash and lime sludge If more than 50% of fines belongs to either the coarse silt size (20 µm < particle size ≤ 75 µm) category, or the medium silt size (7.5 µm < particlesize ≤ 20 µm) category or fine silt plus clay size (particle size ≤ 7.5 µm) category.

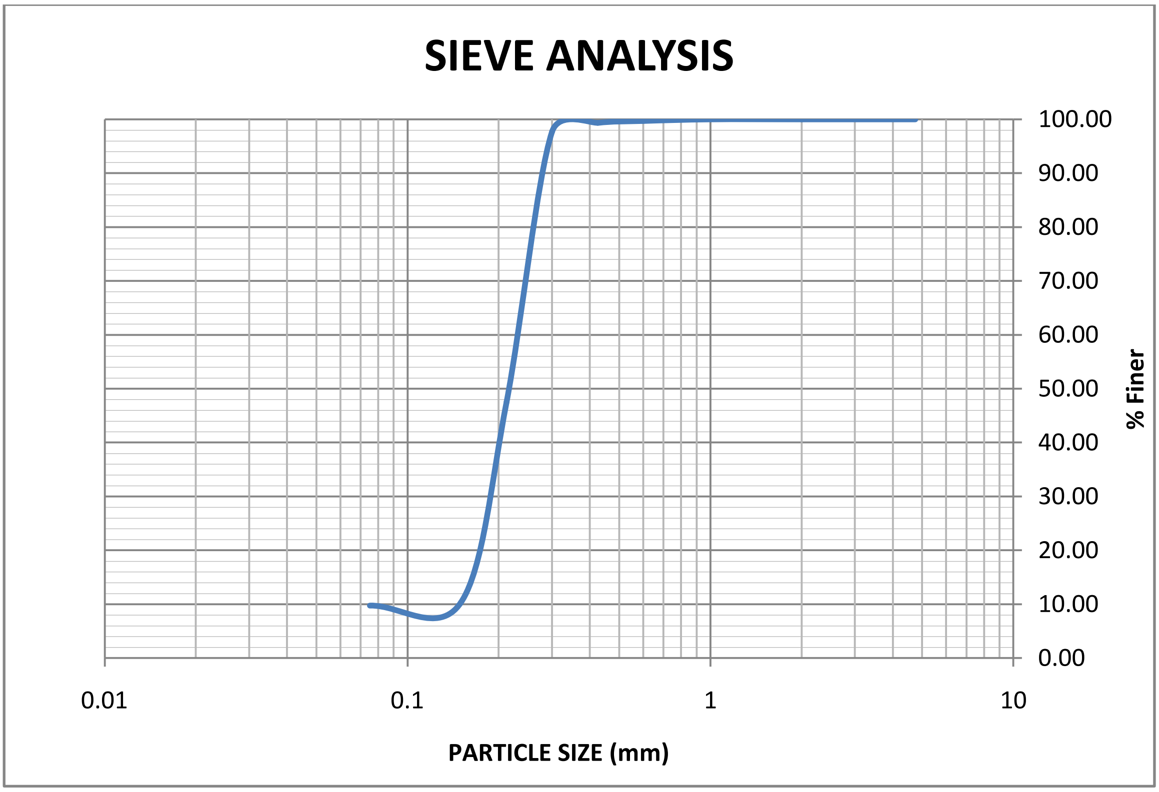

Fig3.1:- Particle Size Distribution

3.2Atterbergs limit:

In geotechnical analysis, determination of the Atterberg's limits is very important. It helps in the classification and identification of the material as well as in the prediction of geotechnical properties like strength, permeability etc. Liquid limit for fly ash and lime sludge was performed as per the standard IS 2720 equivalent to BS: 1377-Part 2, using the cone penetration method. Due to the non-plastic nature of fly ash, plastic limit and plasticity index values were not determined. It is reported in literature that fly ashes have liquid limit ranging from 27.40 to 57.6%. liquid limit increases with increase % carbide sludge.

Table no-3.1 liquid limit with % carbide sludge

Carbide sludge (%)	0	5	10	15	20
Liquid limits (%)	27.6	44.4	45.5	54.5	57.6

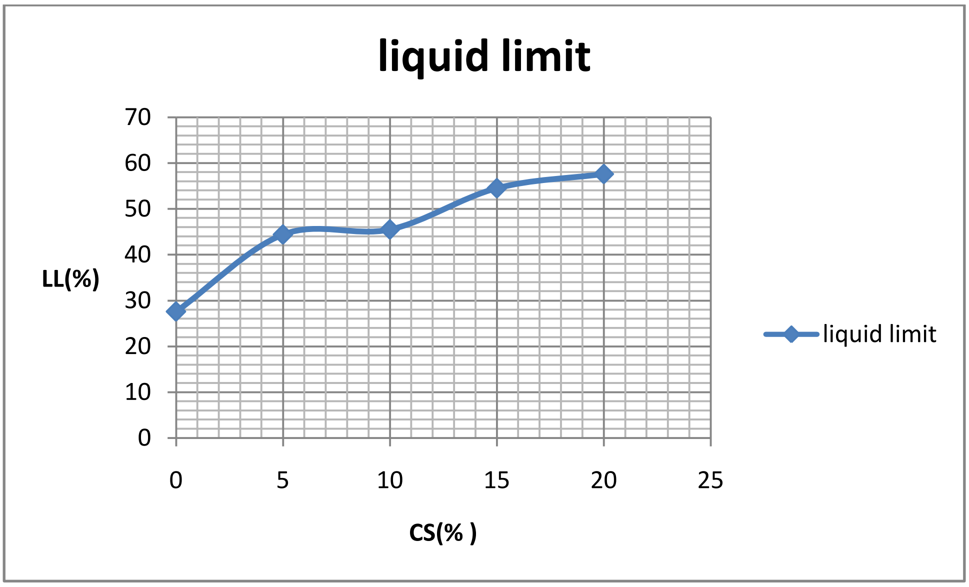

Fig No 3.2:- Liquid Limits

3.3 Compaction test

Compaction characteristics are used to determine the density and moisture relationship of the material. Standard Proctor compaction test was performed to determine maximum dry density (MDD) and optimum moisture content (OMC) values of fly ash and lime sludge as per IS 2720 – Part 8. It was reported that fly ashes have been observed to have maximum dry density 1.36 kN/cm3 and optimum moisture content in the range 21.51% from standard proctor compaction test. Maximum dry density (MDD) increase 1.36 kN/cm3 to 1.56 kN/cm3 and optimum moisture content (OMC) values decrease 21.51% to 15.94%.

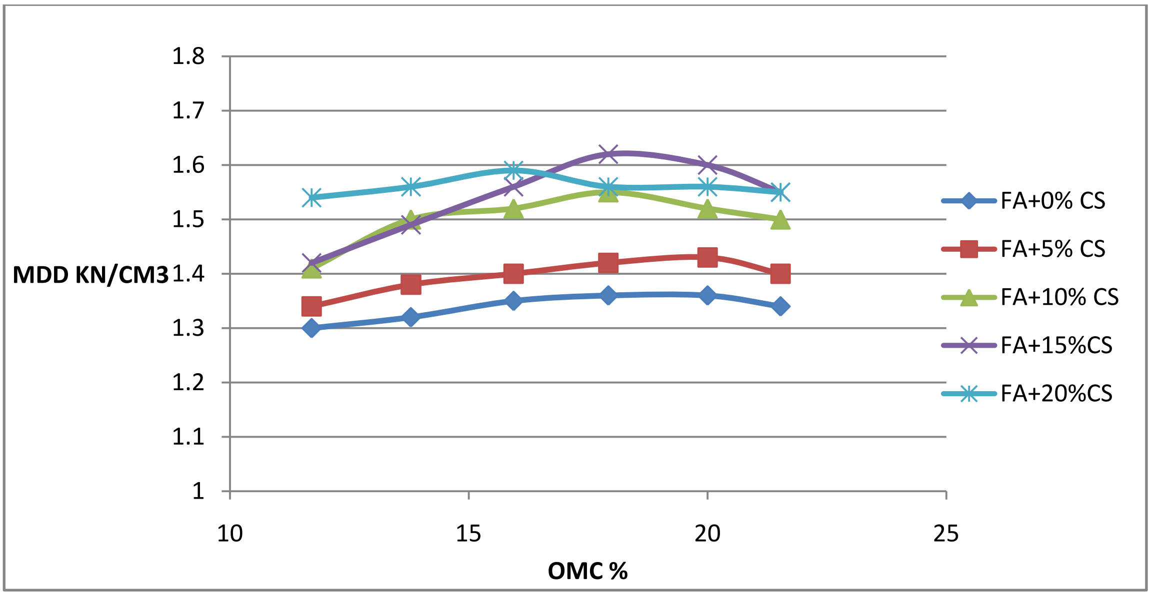

Fig No 3.3:- Maximum Dry Density V/S Optimum Moisture Content

IV.CONCLUSIONS

For stabilized fly ash, the maximum dry density values increases upon carbide sludge. Small addition of carbide sludge (15%) to stabilized fly ash further enhances the engineering properties of the composite, but further addition of sludge decrease the MDD and OMC increase.

REFERENCES:-

[1] Bureau of Indian Standards (BIS). 1980. Methods of test for soils: Determination of water content-dry density relation using light compaction. Compendium of Indian Standard on soil engineering, IS 2720, Part 7, New Delhi.

[2] B. S. Chittoo, and C. Sutherland, 2013, Use of lime-iron sludge for soil modification, Int. J. of Material Sci., 3(2), 39-45.

[3] G. Ambarish and D. Utpal, “Bearing ratio of reinforced fly ash overlying soft soil and defomation modulus of fly ash,” Geotextiles and Geomembranes, vol. 27, no. 4, pp. 313-320, 2009.

[4] IRC SP 58 “Guidelines for use of Fly ash in Road Embankment”.

[5] I.S. code 2720 (Part v)-1970, determination of liquid limit & plastic limit.

[6] Denise Alves Fungaro, Mauro Valério da Silva Instituto de PesquisEnergéticas e Nucleares, IPEN–CNEN/SP, São Paulo, SP, Brasil fly ash and lime sludge studyThe results of this work have demonstrated that sludge-coal fly ash-soil-cement brick can be successfully produced using water treatment plant sludge and cyclone fly ash under the conditions and manufacturing methods used in this study. Legros R, Brereton C.M.H., Lim C.J. and Grace J.R, "Calcination of Lime sludge in a circulating fludized bed". Journal of Pulp and Paper Science, J7173, Vol.13, pp.2, 1992.

[7] I. J. Alinnor, "Adsorption of heavy metals from aqueous solutions by fly ash," Fuel, vol. 86, no. 5-6, pp. 853-857, 2007

[8] Marimuthu. P., Gunasekaran J.P. and Mohan Rao N.R., "Lime Sludge Reburning - A promising approach towards solid waste utilization". IPPTA 1118, Vol.2, pp.1, 1999.

[9] Minnick and others (l971) ,Kokubu (1968) Mehta (1985) 2Valenti and others 1, (1986)$ Monzo and others (1994) aya (1995) Chopra and others (19793 Joshi P 3 3 (1982) and Ravina (1981) have investigated the role of particle size distributions and the reactivity of fly ash. The effect of various grain size distributions on the reactivity of fly ash or on the strength characteristics of fly ash - cement concretes, have been investigated prominently on low-calcium fly ashes.

[10] O. O. Amu, O.F. Bamisaye and I. A. Komolafe, 2011, The suitability and lime stabilization requirement of some lateritic soil samples as pavement, Int. J. Pure Appl. Sci. Tech., 2(1), 29-46.

[11] S Chandra, S Kumar and R K Anand (2005), "Soil Stabilization with Rice Husk Ash and Lime Sludge". Indian Highways, Vol. 33, No. 5, pp. 87-98.

[12] The Use of Fly Ash and Lime Sludge as Partial Replacement of Cement in Mortar Vaishali Sahu *****, V. Gayathri