COMPACTION CHARACTERISTICS OF POND ASH ON CLAYEY SOIL

Anjusha V.K.[1], Ms. Jaseena A. Rasheed[2]

[1]PG Student Dept.of Civil Engineering, SIST College, Vellanad
[2]Assistant Professor, Dept.of Civil Engineering, SIST College, Vellanad

---

Abstract - Soil stabilization is the process of increasing the strength and durability of soil by altering the physical properties of the soil. Pond ash is the residue after combustion of coal in thermal power plants, which is considered as a waste material and its disposal is a major problem from an environmental point of view and also it requires a lot of disposal areas. In this work an experimental study is conducted using Pond Ash on clayey soil at varying percentage such as 10%, 20%, 30% and 40% and optimum dosage for the soil was arrived. The compaction characteristic is examined by conducting standard proctor compaction test.

Key Words: Clayey soil, Pond ash, OMC, MDD.

1. INTRODUCTION

Stabilization is the process which improves the properties of soil. Soil stabilization is usually done by some materials in the form of powder such as lime, cement and fly ash. These stabilizers controls dust and improve its density, permeability, adhesion, compaction and decrease curing time. Large amount of waste are generated from various industries and human activities. Utilising waste as stabilizers will reach optimum economic advantages.

Pond Ash is an industrial waste obtained by the combustion of coal in thermal power plant. Particle sizes of the ash vary from around one micron to around 600 microns. The very fine particles (fly ash) collected from this ash generated by electrostatic precipitators are being used in the manufacture of blended cements. About 120 million tons of pond ash is produced in India. This huge amount of industrial waste can cause serious hazards to the world. The fly ash and pond ash are one of the responsible pollutants of air, soil and water. These wastes require huge space for their disposal. About 25% is utilized for Roads, Buildings and other Civil engineering applications. Bulk utilization of Pond ash is being carried out for road embankment construction in the ongoing massive road development programs taken up by the Government of India viz. National Highway Development Program (NHDP) and Pradhan Mantri Gram Sadak Yojana (PMGSY). Pond ash has potential to improve the engineering behaviour of soil.

2. EXPERIMENTAL DETAILS

2.1 Materials

Clayey Soil; Clay is collected from Mudavanmugal in Thiruvanathapuram district. It appears to be brown in colour. Table1 shows the initial properties of clay.

Table-1 Properties of Clayey soil

SI NO.	DESCRIPTION	VALUES
1	Specific gravity	2.38
2	Liquid limit (%)	63.64
3	Plastic limit (%)	17.64
4	Plasticity index	46
5	Grain size distribution (a) Clay (%) (b) Silt (%)	 55.2 44.8
6	Maximum dry density(kN/m^3)	14.1
7	Optimum moisture content (%)	30.6
8	UCS(kN /m^2)	21
9	Soil classification	CH

Pond ash; Collected from Emerald building solution agency. Pond Ash is fine grained and it is light brown in colour.

Table-2 Properties of Pond ash

Properties of pond ash	Value
Specific gravity	2.25
Uniformity Coefficient (C_u)	2.82
Coefficient of Curvature (C_c)	0.65
Effective size,D_{10} (mm)	0.081
Cohesion (kN /m^2)	14
Angle of internal friction(degree)	34.5

2.2 Preparation of sample:

The samples are prepared by taking varying percentage Pond ash (10%, 20%, 30% and 40%). For testing the initial properties, the clay should be taken in appropriate quantities (amount of clay varies with tests) and this clay in dry state is mixed with water to prepare the samples. In order to find out the properties of clay after stabilisation tests should be done using the samples after adding stabilisers to it. That is, the samples should again be prepared by mixing clay in dry state and water along with the stabilisers.

3. RESULTS AND DISCUSSION

This chapter discusses about the Compaction characteristics of clayey soil stabilized with Pond ash. Light compaction test was carried out on clayey soil to determine optimum moisture content (OMC) and maximum dry density (MDD).

Table -3: Variation of MDD and OMC with varying % pond ash

Sl. No	Pond Ash (%)	Maximum Dry Density(kN/m^3)	Optimum moisture content (%)
1	0	14.1	30.6
2	10	15.34	28.57
3	20	15.85	21.428
4	30	16.03	20.51
5	40	15.36	26.96

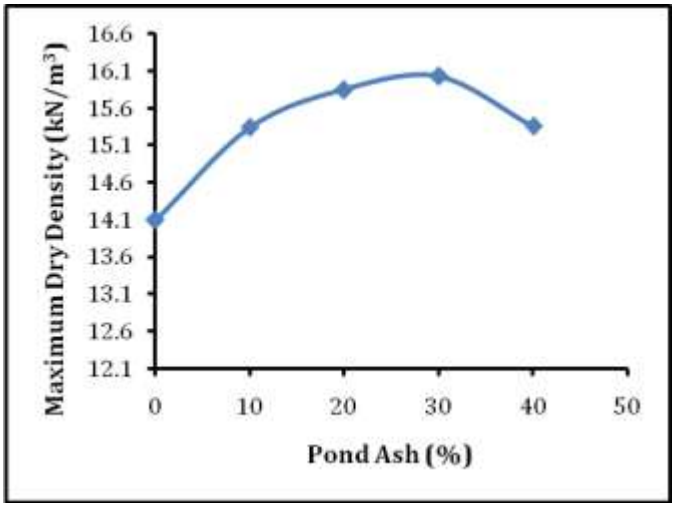

Fig 1; Variation of MDD with varying % of Pond ash

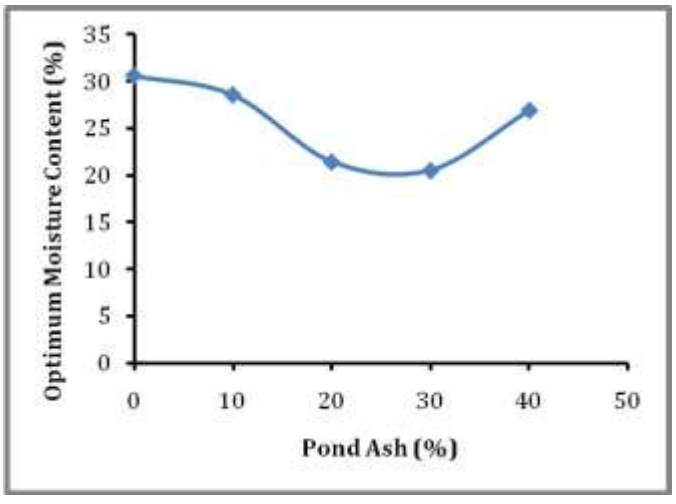

Fig 2; Variation of OMC with varying % of Pond ash

From the above figures shows that Pond Ash exhibits a decrease in optimum moisture content and increase in dry density upto 30%. Dry density of the clay increased by 16.03kN/m^3 with increase of Pond Ash content upto 30%. The reason behind the improvement of soil properties is because of the frictional resistance from Pond Ash in addition to the cohesion from clayey soil [3]. The OMC was obtained as 20.51% with the addition of 30% of Pond ash. It can be seen that the OMC of the clay decreased with increase in Pond Ash content upto 30%. This is due to Pond Ash replaces adsorbed water with organic cations, thus neutralizing the negative charge on a clay particle.

4. CONCLUSION

Stabilization is the physical, chemical, biological or combined method of changing a natural soil to meet an engineering purpose. The optimum moisture content goes on increasing and maximum dry density goes on decreasing on addition of Pond Ash. The optimum value of moisture content is 20.51% and maximum dry density obtained is 16.03 kN/m^3. Thus the optimum percentage of pond ash obtained is 30%. The maximum dry density of the soil increases and the optimum moisture content of the soil decrease because the Pond Ash removes the water and air present in the soil and forms a cementing bond between soil particles.

REFERENCES

[1] Agnihotri A.K. and Yadav M. ;(2014), "Influence of pond ash on the behaviour of soil", Journal of Civil Engineering and Environmental Technology, Vol: 1, PP: 34-37.

[2] Gupta L.; (2016), "Analysis of combined effect of pond ash and jute fiber on soil Subgrade characteristics", International Conference on Structural Architectural and Civil Engineering, Vol: 2, PP: 79-87.

[3] Kumar S.; Khusro A. and Pandurang A. ;(2018), "Intensification of Soil properties influence by Synthetic Fibre and Pond Ash", International Research Journal of Engineering and Technology, Vol: 5, Issue 6, PP: 764-768.

[4] Maity J. and Chandra B.; (2016), "Bearing capacity of reinforced pond ash", International Journal of Engineering and Advanced Research Technology, Vol: 2, Issue 12, PP: 9-12.

[5] Satyanarayana P.V.V.; Pradeep N. and Varma S.C.; (2013), "A Study on the performance of Pond Ash in place of Sand and Red Soil as a Subgrade and fill material", International Journal of Engineering and Advanced Technology, Vol: 3, Issue 1, PP: 285-288.

[6] Sharma M. and Kumar S.; (2019), "Behaviour of geogrid encased stone column in pond ash fills", International Journal for Research in Applied Science & Engineering Technology, Vol: 7 Issue 4.

[7] Tahir M .F. and Goyal T. ;(2019), "Improvement of engineering properties of soil using pond ash and alccofine", International Research Journal of Engineering and Technology, Vol: 6, Issue 3.