Assessment Of Natural Sand And Pond Ash In Indian Context

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ABSTRACT -***Energy generation is increasing day by day due to rapid industrialization. Energy generation through thermal power plants is very typical now days. Pond ash (PA) from these thermal plants is available in large quantities. Pond ash utilization helps to reduce the consumption of natural resources. In current time natural sand are using and a it is costly so it's require to replace by Pond Ash. Use of alternative material in concrete such as industrial by - product coal Ash (Fly Ash and Pond Ash) is an important eco efficiency drive. It is also the social responsibility of researchers to encourage the "beneficial use of industrial by- products in order to preserve resources, conserve energy and reduce or eliminate the need for disposal of industrial waste in landfills. This research paper reports the basic properties of Pond ash. It also compares these properties with natural natural sand. Basic changes in both type of aggregate properties were determined by various test as per require IS code, thus, it is a suitable to use pond ash as fine aggregate or partial replacement with natural sand.***

Keywords : Pond ash , Fine Aggregate, Properties

INTRODUCTION

Concrete is a construction material composed mainly of Cement, Fine Aggregate (Sand), Coarse Aggregate, Water and Admixture. River sand is the most commonly used Fine aggregate in many parts of the world. The huge demand for concrete has made this natural resource to get impoverished. On one side extraction of river sand in excess has conspicuous environmental impacts, on the other side, large quantity of coal ash is being produced every day in Thermal Power Plants, leading to many environmental problems.

It is of prime importance to carry out research works on the feasibility of using alternative materials like Pond Ash, a waste by product and its suitability for potential utilization in concrete constructions, which can replace sand partially or fully as an alternative construction material contributing to sustainability and reducing burden on environment.

Concrete is the most used construction material across the world and in concrete maximum part is Fine aggregate. Hence, if pond ash used as at least partial replace with fine aggregate than it will reduce cost of concrete production. Pond ash are needed from the view of point of experimental preservation and effective utilization of resources. However, information about pond ash using in concrete as fine aggregate with partial replace with pond ash is still insufficient so it will be an advisable to get more details about the characteristics of concrete using pond ash.

PROPERTIES OF AGGREGATE

There are various properties of aggregate which have to check before use in concrete Such as Basic properties- Specific gravity, water absorption, and mechanical properties like fineness modulus, slit content etc. must be determine before use in concrete, these all properties directly effect on design and behaviour of concrete.

For the possibilities to use of natural sand as fine aggregate in concrete with replace of pond ash than it should require to determine all test according to IS code and compare with pond ash properties by such a these type of primary test.

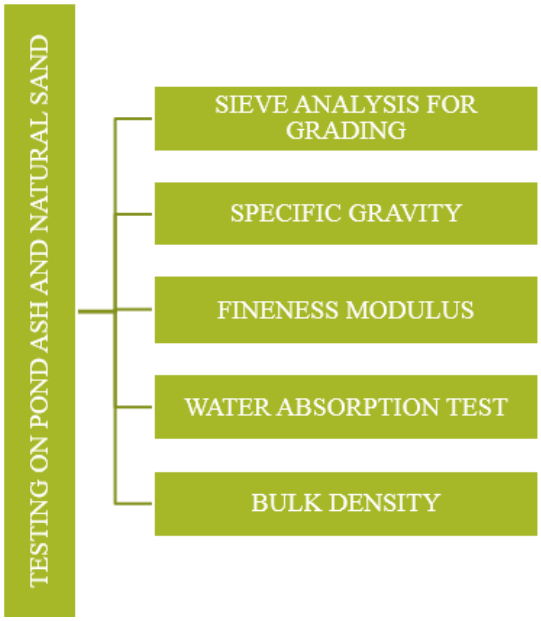

Figure 1: Test required for aggregate

From the result of these tests it can be conclude that, pond ash will permissible to use in concrete. So these pond ash can be used as fine aggregate with partial replacement of natural sand.
These entire as above test were done in BVM engineering collage, Vallabh Vidyanagar, Gujarat with Natural sand and pond ash.

TEST OF PROPERTIES & MATHODOLOGY

1. SIEVE ANALYSIS FOR GRADING OF COARSE AGGREGATES [IS 2368– (PART – I) 1963]

Pile-up the bulk sample received in conical form till cone flattens. Obtain the sample for screening by method of quartering so that suitable weight for sample testing is available. Air dries the sample at room temperature or by heating at 100˚C –110˚C. Weigh the air dried sample. Place the set of sieves in descending order of their sizes on pan. Place the sample in top coarse sieve and fit the lid. Shake whole assembly in all directions for not less than 2 minutes by hand movements/on shaking platform. Remove the lid and weigh the residue carefully retained on each sieve. Tabulate the results on performance. And decide grade of aggregate from Table No 2, IS 383-1970

2. FINENESS MODULUS

Take 1 kg. of aggregate from laboratory sample of 10 kg. Arrange the sieve in order of the size numbers. Fix them in sieve shaker with the pan at the bottom and coffer at top, find out the weight of each sieve. After this process calculate total of all % weight of retained on particular sieve and divide by 100. Hence, value of Fineness Modulus which unit is in number. Which shows the number of sieve from bottom to top and that sieve size is the maximum size of the aggregate.

3. SPECIFIC GRAVITY OF AGGREGATES [IS: 2386 – (PART – III) 1963]

Wash thoroughly two kg. of aggregate sample to remove fines, drain and then place in wire basket and immerse in water at a temperature between 22˚C to 30˚C with a cover of at least 5 cm. of water above the top of basket. Immediately after immersion, remove the entrapped air from the sample by lifting the basket containing it, 25 mm above the base of tank and allowing it to drop 25 times at about 1 drop per second. Keep the basket and aggregate completely immersed in water for a period of 2 hours afterwards. Weigh the basket and sample while suspended in water (A-1) Remove the basket and aggregate from water. Allow to drain for few minutes after which gently empty the aggregate from the basket on dry cloth. Return the empty basket to the water and weigh in water (A-2) Place the aggregate on the dry cloth and gently surface dry with the cloth and transfer it to the second dry cloth, when the first will remove no further moisture. Weigh the surface dried aggregate. (B) Place the aggregate in a shallow tray and keep it in oven for 24 hours at a temperature of 100˚C to 110˚C. Remove it from oven, cool in an air tight container and weigh **(C).** Calculate the Specific Gravity By = C/ (B-A)
Where, A=A1-A2

4. WATER ABSORPTION OF AGGREGATE [IS: 2386 – (PART – III) 1963]

Wash thoroughly @ two kg. of aggregate sample to remove fines, drain and then place in wire basket and immerse in water at a temperature between 22˚C to 30˚C with a cover of at least 5 cm. of water above the top of basket. Immediately after immersion, remove the entrapped air from the sample by lifting the basket containing it, 25 mm above the base of tank and allowing it to drop 25

times at about 1 drop per second. Keep the basket and aggregate completely immersed in water for a period of 2 hours afterwards. Weigh the basket and sample while suspended in water (A-1) Remove the basket and aggregate from water. Allow to drain for few minutes after which gently empty the aggregate from the basket on dry cloth. Return the empty basket to the water and weigh in water (A-2) Place the aggregate on the dry cloth and gently surface dry with the cloth and transfer it to the second dry cloth, when the first will remove no further moisture. Weigh the surface dried aggregate. (B) Place the aggregate in a shallow tray and keep it in oven for 24 hours at a temperature of 100˚C to 110˚C, remove it from oven, cool in an air tight container and weigh (C). Calculate water absorption = [100-(B-C)]/C

5. BULK DENSITY [IS: 2386 – (PART – III) 1963]

This method of test covers the procedure for determining unit weight or bulk density and void of aggregates. The measure shill be filled to overflowing by means of a shovel or scoop, the aggregate being discharged from a height not exceeding 5 cm above the top of the measure. Care shall be taken to prevent, as far as possible, segregation of the particle sizes of which the sample is composed. The surface of the aggregate shall then be levelled with a straightedge. The net weight of the aggregate in the measure shall then be determined and the bulk density calculated in kilogram per litre.

TABLE NO. 1
PROPERTIES TEST RESULT OF NATURAL SAND AND POND ASH

Sr.No	Name of test	Natural Sand	Pond Ash	IS Code	Permissible code
1	Specific Gravity	2.65	1.89	IS 2386 (Part III)-1963	-
2	Fineness Modulus	2.79	1.23	IS 2386 (Part I)-1963	-
3	Sieve analysis for grading	II	Nearly IV	IS 2386 (Part I)-1963	see IS 383-1970 Table 4
4	Water Absorption (%)	0.99%	20%	IS 2386 (Part III)-1963	0.7% to 1.3%
5	Bulk Density (kg/m^3)	1759	840	IS 2386 (Part III)-1963	-

TABLE NO. 2
SIEVE ANALYSIS OF NATURAL SAND AND POND ASH

Sr. No	IS Sieve Size	% wt. Passing		Specification as per IS:383			
		Natural Sand	Pond ash	Zone 1	Zone 2	Zone 3	Zone 4
1	10mm	100	100	100	100	100	100
2	4.75mm	99.5	100	90 - 100	90 - 100	90 - 100	95 - 100
3	2.36mm	83.4	100	60 - 95	75 - 100	85 - 100	95 - 100
4	1.18mm	73.8	99.79	30 - 70	55 - 90	75 - 100	90 -100
5	600 micron	46.3	99.26	15 - 34	35 - 59	60 - 79	80 - 100
6	300 micron	11	61.44	05-20	8 - 30	12 - 40	15 - 50
7	150 micron	6.6	16.44	0 - 10	0 - 10	0 - 10	0 - 15

TABLE NO. 3
PROPERTIES TEST RESULT OF NATURAL SAND AND POND ASH

Sr. No	Constituent Compounds	Test Method	Result obtained	
			Pond Ash	Natural Sand
1	CaO%	IS-1727	0.25	3.9
2	SiO_2%	IS-1727	73.6	76.66
3	Al_2O_3%	IS-1727	9.1	11.45
4	MgO%	IS-1727	0.05	0.75
6	Na_2O%	IS-4032	0.004	1.15
7	K_2O%	IS-4032	0.002	1.83
8	TiO_2%	IS-4031	Nil	nil
9	Fe_2O_3%	IS-4031	1.35	3.72
10	Loss on Ignition%	IS-1727	3.7	0.54

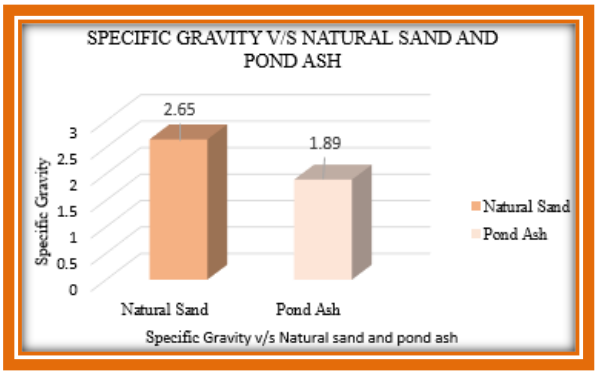

Figure 2: Specific Gravity v/s Natural Sand and Pond ash

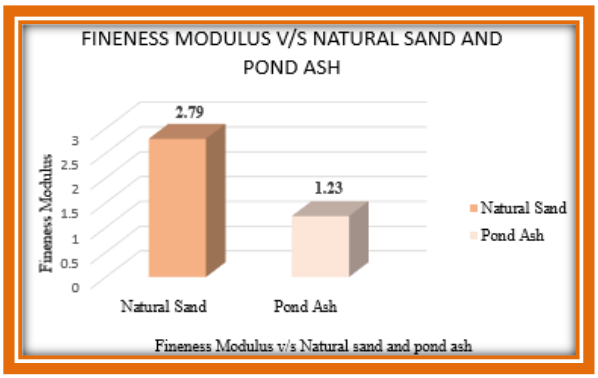

Figure 3: Fineness Modulus v/s Natural sand and Pond ash

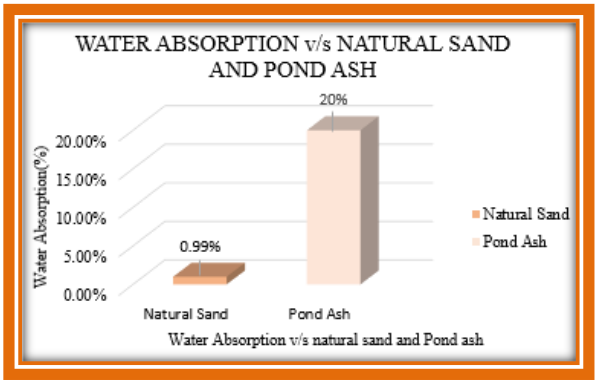

Figure 4: Water Absorption (%) v/s Natural sand and Pond ash

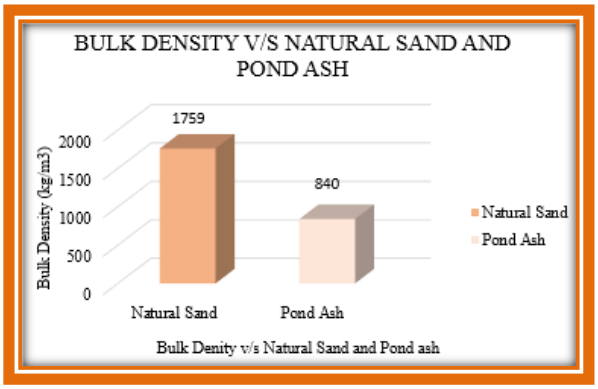

Figure 5: Bulk Density (kg/m^3) v/s Natural Sand and Pond ash

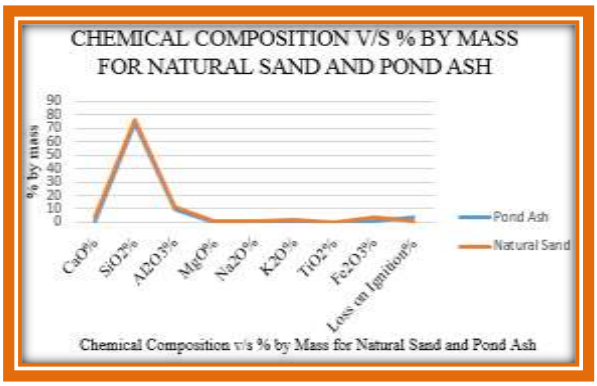

Figure 6: Chemical Composition v/s % by Mass for Natural Sand and Pond Ash

CONCLUSIONS

Based on limited experiment Investigation of properties of aggregate, following observation can be concludes:

a) Specific Gravity for Natural Sand it is 2.65 and for Pond ash it is 1.89. So Pond Ash satisfied limit of Specific Gravity as per IS Code.

b) Fineness Modulus for Natural Sand it is 2.79 and for Pond ash it is 1.23. So Pond Ash satisfied limit of Fineness Modulus as per IS Code

c) Sieve Analysis for sand it is Zone II and for Pond ash it is Nearly IV.

d) Water Absorption for Natural Sand it is 0.99 % and for Pond ash it is 20% So Pond Ash satisfied limit of Water Absorption as per IS Code

e) Bulk Density for Natural Sand it is 1759 Kg/m^3 and for Pond ash it is 840 Kg/m^3. So Pond Ash satisfied limit of Bulk Density as per IS Code

f) Chemical Composition for Natural Sand and for Pond ash. So Pond Ash satisfied limit of Chemical Composition as per IS Code

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