A REVIEW "EVALUATION OF THE USE OF BOTTOM ASH AND POND ASH IN S-GLASS FIBRE CONCRETE"

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Abstract: Pond ash is the ash that is taken out of the ash ponds of thermal power plants that use coal as fuel. It has coarse particles that range in size from 300 microns to 1 mm. Restrictions placed on sand dredging are quickly causing a shortage of natural sand in many parts of India, which has had a significant impact on the construction industry. The building sector is looking for alternative aggregate that is more affordable than traditional fine aggregate. In addition to offering a practical solution to the shortage of sand and crushed stone, the use of pond ash to partially replace conventional fine aggregate in concrete mixes also lessens the environmental impact of coal ash disposal. The concrete will be tested at various ages (3,7, and 28 days) and was mixed with varying amounts of pond ash. Pond ash concrete's results were contrasted with those of control concrete. Slump was kept constant at 100–120 mm for all dimensions. We'll test a pond ash concrete's property in both its fresh and hardened states. In this study, the partial substitution of sand with pond ash will be compared to normal concrete and the differences will be discussed.

Keywords – bottom ash, pond ash, fine aggregate, alternate aggregate, concrete, S-Glass fiber concrete.

I. INTRODUCTION

In order to meet the varied qualities of concrete, extensive study has been done on the usage of alternative materials in concrete. One such substitute material that works well to take the place of the natural material is pond ash. Mostly fly ash and bottom ash are created when coal is burnt. By using an electrostatic precipitator, fly ash is collected. The ash that collects at the bottom of the boiler is combined with water, transported through pipes out of the facility and then discharged into a field. Whatever ash is left over after evaporation is known as pond ash.

Pond ash can be used in mass concrete construction, earth fill, geotechnical and highway construction, but its use in structural concrete is restricted due to technical and other considerations. This encourages the usage of a significant quantity of pond ash produced by thermal power plants. In 2012, India's power output is anticipated to increase from 1,12,090 MW to 2,12,000 MW. The amount of ash in ash ponds has increased from about 450 million tonnes in 1999-2000 to more than 900 million tonnes in 2005- 2006. Every year, 65 to 75 million tonnes of ash are still left over and discharged there.

Pond ash removal presents a significant difficulty to everyone due to their number, which is always growing.
Consequently, a global search was conducted to One of the most efficient techniques of utilisation is to use this waste material in concrete as a partial replacement for cement. Consideration is given to the idea of using pond ash, a byproduct of thermal power plants, in place of cement in concrete.

II OBJECTIVES OF THE STUDY

The objectives of the study are:

- Partial Replacement of FA with pond ash and bottom ash in S-GLASS fiber concrete.
- To find the workability of concrete for different percentage replacement of FA with pond ash and bottom ash.
- The flexural behavior, Compressive-strength, and Split tensile-strength behavior should be studied by using available equipments in the laboratory. To determine the strength properties of concrete for different percentage replacement of FA with pond ash and bottom ash in S-GLASS fiber concrete.

III LITERATURE REVIEW

Khairunisa Muthusamy , Mohamad Hafizuddin Rasid , Gul Ahmed Jokhio , Ahmed Mokhtar Albshir Budiea , Mohd Warid Hussin , Jahangir Mirza (2020)
The current study examines how CBA affects the mechanical, fresh, and durability characteristics of concrete as stated in the literature. A variety of sources and years of research have been used to determine the chemical and physical characteristics of CBA, which are affected by the coal combustion system. Due to its high silica content, CBA possesses pozzolanic properties. Numerous experimental studies showed that CBA can be utilised

in the right amounts to benefit from improved workability, fine particles in concrete.
strength, and durability of concrete.

Avadhut Kshirsagar, Ramachandra Hegde (2020)
Two grades of concrete, M30 and M40, were chosen in order to determine the suitability of pond ash as a fine aggregate substitute in concrete. Pond ash was substituted for 15%, 17.5%, 20%, 22.5%, and 25% of the traditional fine aggregate in concrete mixes for each grade. After twenty-eight days of curing, the compressive and flexural strengths of the prepared concrete specimens were evaluated. The results of the testing revealed a substantial difference between the strengths of pond ash- and conventional-concrete. The specimens with a 20% replacement level of pond ash demonstrated the greatest vigour.

ADITYA VERMA, ABHISHEK KUMAR, ASHISH MISHRA, ARJIT VERMA (2016)
The use of pond ash as a partial replacement for cement in concrete mix is reviewed in this research. These days, there are several coal-based power plants that produce a lot of fly ash, bottom ash, and pond ash. The disposal of fly ash presents a significant environmental challenge. This study incorporates the findings of several scholars in this field and demonstrates the impact of pond ash addition on various concrete qualities.

K. M. Bagwan, S. S. Kulkarni (2015)
This study examined the usage of pond ash in concrete through an experimental inquiry. Pond ash utilisation needs to be considered carefully today in order to protect natural resources and achieve sustainable development. Different pond ash percentages were used to produce the concrete (15, 25, 35, 45, and 55%), and it was tested at various ages (3, 7, 28, 56, 90, and 180 days). Pond ash concrete's results were contrasted with those of control concrete. Slump was kept constant at 100–120 mm for all dimensions. A pond ash concrete's property was examined in both its fresh and hardened states. Due to the decreased cement content, the IST and FST of pond ash concrete continue to rise as pond ash replacement levels rise. Additionally, it was discovered that the rate of rise of compressive strength at early ages, notably 3, 7, and 28 days, was low and that this rate increased throughout later ages rate increased. This demonstrates that the pond ash concrete's later age strength is excellent and that it can be used to make concrete that is very important in the current context of sustainability in the construction industry.

Mihir Rathod,Shipra Sharma (2015)
This study discusses the potential use of fly ash and pond ash as cement substitutes in concrete mixes. The study looked at the impact of pond ash waste on concrete properties like mechanical (compressive strength, splitting tensile strength, and flexural strength) and durability characteristics (rapid chloride penetration, and deciding salt surface scaling), as partial replacement of fine aggregates in various percentages. This essay reviews the literature on using fly ash and pond ash in place of some of the cement and

Vikas R Nadig, Sanjith , Ranjith, Kiran (2015)
The mechanical properties of concrete, such as compressive strength, splitting tensile strength, and flexural strength, are primarily the emphasis of this study's assessment of the characteristics of concrete incorporating bottom ash as a partial replacement for fine aggregates. There is a review of ten separate study publications. The application of Bottom ash makes a significant contribution to resource saving and waste reduction.

IV. MATERIALS

Pond Ash: Pond fly ash is the term used to describe the fly ash that is produced when the bottom and water are thoroughly combined, creating a slurry, and then the mixture is drained off in ponds slightly bigger and rougher than the rest. Table 3.14 lists various chemical characteristics according to NTPC Data Records.

Table 1: Physical Properties of Pond Ash

Sr. No.	Properties	Results obtained
1.	Specific Gravity	1.69
2.	Bulk Density (kg/l)	1.15
3.	Water Absorption (%)	1.8
4.	Fineness modulus	3.01

Fig no.1 Pond Ash

Bottom Ash: Bottom ash, which makes about 20% of the gross ash content of the coal fed into the boilers in modern major thermal power plants, is the coarser material that settles to the bottom of the furnace. It is a byproduct of burning household and other types of garbage and is made of

noncombustible elements. Raw bottom ash is a granular substance made of a mixture of inert substances such sand, stone, glass, porcelain, metals, and ceramics substance charred to ash. A novel opportunity in concrete mix design, the use of coal ash in normal strength concrete would benefit the building sector by lowering construction costs and ash content if used widely.

fig. 2: bottom ash

S-GLASS FIBER: S-glass is a high performance glass fiber, distinguished from E-glass primarily by its higher silica content. S-glass typically contains the oxides of silicon, aluminum, and magnesium with the following mechanical properties:

Table 2: Mechanical Properties of S-GLASS FIBER

Density	**2.53 g/cm3 (157.9 lb/ft3)**
Tensile strength	**4,600 MPa (670 ksi)**
Modulus of elasticity	**89 GPa (12,910 ksi)**
Percent elongation	**5.2**

Fig no. 3 S-GLASS FIBER

S-fiberglass has a tensile strength and elastic modulus that are significantly higher than those of E-glass, as well as a 10% increase in stiffness. Excellent temperature resistance, good moisture resistance, extended fatigue and shelf life, and other distinguishing qualities are also important. It is suited for use in demanding applications thanks to these characteristics. For instance, gaskets, cargo liners, and other interior parts are frequently made with it in the aerospace sector.

Cement: Ordinary Portland cement of grade 53 is used for this experimental work. On cement various experimental tests will be carried out to determine final & initial setting time, standard consistency, and compressive strength according to IS 4031 and IS 269-2015

Fig no. 4 cement

Table -1: Physical Properties of Cement

Sl no.	Test conducted on cement	Observation
1	Specific gravity	3.14
2	Normal consistency	29%
3	Initial setting time	140 min
4	Final setting time	280 min
5	Compressive strength7 days 28days	 41 Mpa 55 Mpa

Fine aggregate: The fine aggregate which was used was locally available river sand, which passed through 4.75 mm.The specific gravity of fine aggregate is 2.65 and fineness modulus is 2.67. Bulk density of fine aggregates is 1.29 and compacted bulk density is 1.48.

Coarse aggregate: The material which is retained on BIS test sieve number 4 (4.75mm) is termed as coarse aggregate. The broken stone is generally used as a stone aggregate. Coarse aggregate used is locally available crushed angular aggregate of size 20mm and 10mm are used for this experimental work.

Fig no. 5 Coarse aggregate

Table-3: Properties of coarse aggregate

Properties	12.5mm	20mm
Water absorption	0.6%	0.4%
Specific gravity	2.66	2.68
Bulk density (kg/m3)	1555kg/m3	1504kg/m3

Water: According to IS: 456-2000, for all works on concrete, potable water is used.

V. PROPOSED METHODOLOGY

The study investigated the effect of waste pond-ash as partial replacement of fine aggregates in various percentages, on concrete properties such as mechanical (compressive strength, splitting tensile strength and flexural strength) and durability characteristics (rapid chloride penetration and deciding salt surface scaling) of the concrete. This paper deals with the review of literature for fly-ash and pond-ash as partial replacement of cement and fine aggregates in concrete.

The concrete will be tested at various ages (3,7, and 28 days) and was mixed with varying amounts of pond ash and bottom ash in replacement to fine aggregate. Pond ash and bottom ash concrete's results were contrasted with that of standard concrete. Slump was kept constant at 100–120 mm for all dimensions. We'll test a pond ash concrete's property in both its fresh and hardened states. In this study, the partial substitution of sand with pond ash will be compared to normal concrete and the differences will be discussed.

VI. CONCLUSIONS

From reviewing the above research papers related to fly-ash and pond-ash relevant Conclusions can be made:

(1) The use of fly ash enhances the concrete's workability.

(2) Fly ash concrete shrinks similarly to mix control for concrete.
(3) Fly ash concrete outlasts OPC concrete in terms of durability.

(4) The use of fly ash normally has no effect on the density or air content of the concrete mix.

(5) In general, 5% replacement rates of fly ashes yield the highest values of the compression and splitting tensile strengths of concretes made with fly ash additives. Compressive and splitting tensile strengths were shown to decrease as the replacement rate rose.

(6) The compressive strength increases as fly ash fineness increases.

(7) As the curing time is prolonged, the compressive strength of concrete containing pond ash increases.

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