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Experimental Study on Partial Replacement of Cement by Pulverized Pond Ash in Concrete

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Abstract: We have done the experiments by conducting and to find the experimental study on partial replacement of cement by pulverized pond ash in concrete. cement plays a major role in binding property. Due to depletion of cement production, finding an alternate material for cement is needed. In this project, the pond ash is utilized as a partial replacement for cement. The work was carried out cement is replaced with pulverized pond ash in various percentage 0%, 5%, 10%, 15% and 20% to get the maximum strength of the concrete. In this investigation of compressive strength, modulus of elasticity (using the load deflection curve) of 28 days of curing ofM20 grade of concrete as per 10262-2019. From this study it is determine that 10% of pond ash replaced as cement give optimum strength.

Keywords: HSC, Cement, pond ash, concrete

I. INTRODUCTION

The pond ash is a combination of unused fly ash and bottom ash from thermal power plants, mixed in slurry from and deposited in ponds. Concrete is a very versatile building material that is used in nearly every aspect of the infrastructure of developed countries. It is used in structural components such as beams, columns, floors, walls and dams. It is also used in pavement applications like parking lots, roads, etc., The high cost of conventional construction material affects economy of structure and also availability of raw materials is very less due to higher use of concrete. Because of this,waste materials are used for replacing the construction materials. Use of the waste materials not only helps in getting them utilized in cement, concrete and other construction materials, but also has numerous indirect benefits such as reduction in landfill cost, saving in energy, and protecting environment from possible pollution effect. Cement is the most important ingredient of concrete. One of the important criteria for the selection of cement is its ability to produce improved microstructure in concrete. The selection of proper grade and good quality of cement is important for obtaining HSC. Some of the important factors, which play a vital role in the selection of the type of cement are compressive strength at various ages, fineness, heat of hydration, alkali content, Tri-Calcium Aluminate (C3A) content, Tri-Calcium Aluminate (C3S) content, Di-Calcium Silicate (C2S) content and compatibility with admixture etc. The fly ash obtained from power station need suitable method for its disposal. So the best suitable method which all the power plant uses is wet disposal method. The fly ash, bottom ash and water are mixed until slurry is obtained and then the slurry is disposed in open lands. After the drying of that slurry clinkers are formed that can be collected as pond ash. Pond ash is used as replacement material for cement in concrete. Pond ash is the combination of coal; fly ash and bottom ash mixed together with water to form slurry and pumped to the ash pond area. In ash pond area, ash is settled and excess water is decanted. These deposited ashes are called pond ash. It is used as a filling material including in the construction of roads and embankments.

II.MATERIALS

2.1 CEMENT

In this work ordinary Portland cement of 53 grade was used in concrete mixes. The test are conducted in cement specific gravity of 3.15, fineness 300.6.

2.2 POND ASH

Pond ash was replaced to cement. Pond ash is a waste product from boilers, where the coal is burnt to heat the water for preparing the steam. It is mainly obtained from the wet disposal of fly ash.. Physical properties specific gravity2.17.

2.3 SUPER PLASTICIZER

Conplast SP 430 provides strength gain at early ages and major increases in strength at all ages by significantly reducing water demand in a concrete mixes. It also improves the durability by increasing ultimate strengths and reducing concrete

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permeability. Physical properties specific gravity 1.18 @25 cAir content was less than 2% of air entrained at normal dosage.

2.4 FINE AGGREGATE

Manufactured sand is produced from hard granite stone by crushing. The crushed sand is of cubical shape with grounded edges, washed and graded to as a construction material. The basic tests were conducted fineness, specific gravity, bulk density of M-sand (2.67,2.6, 1580Kg/m^3)

2.5 COARSE AGGREGATE

The coarse aggregate is the strongest and least porous component of concrete. crushed granite coarse aggregate provides better interlocking and hence it helps achieve higher strength than rounded gravel aggregate. The basic tests were conducted fineness, specific gravity, bulk density of M-sand (2.7, 7.17, 1597Kg/m^3)

Fig 1 Materials Used

III.EXPERIMENTAL WORK

3.1 COMPRESSION TEST

Compressive strength is the ability of material or structure to carry the loads on the surface without any crack or deflection. A material under compression tends to reduce the size, while in tension, size elongates. compressive strength was tested of cubes (150X150X150mm). In this test the maximum load applied to the specimen the reading at failure of maximum load .Compressive strength formula for any material is the load applied at the point of failure to the cross section area of the face on which load was applied.

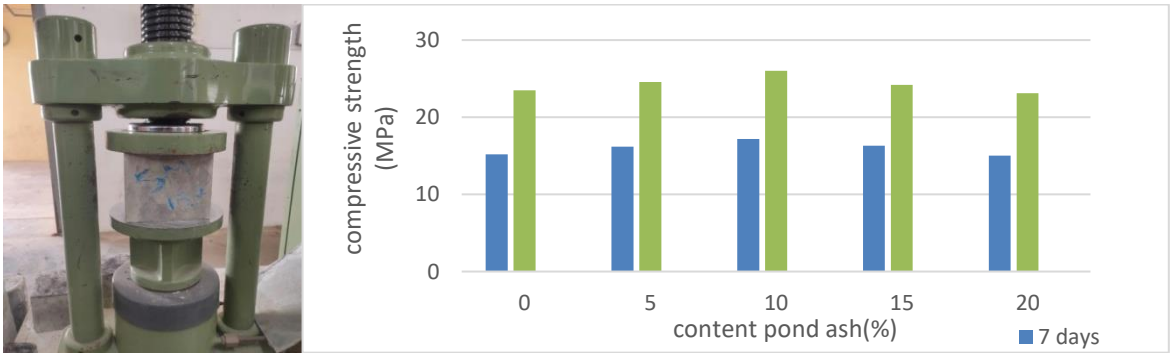

Fig 2 compressive strength

3.2 MODULUS OF ELASTICITY

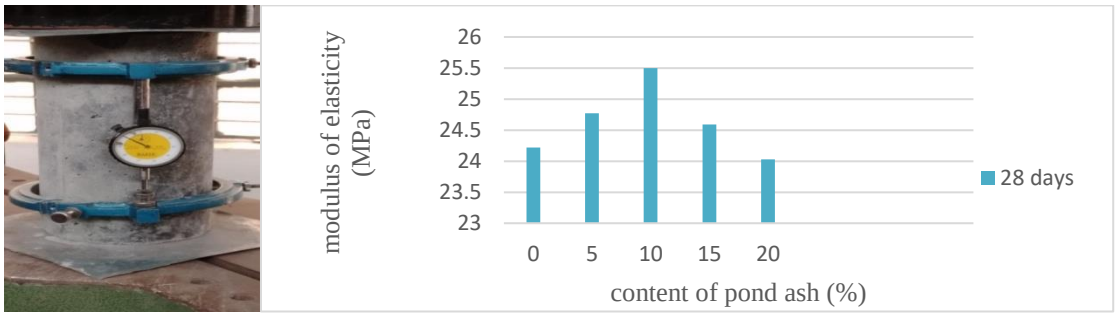

Fig 3 modulus of elasticity

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Elastic modulus is a quantity that measures an object or substance's resistance to being deformed elastically when a stress is applied to it. The elastic modulus of an object is defined as the slope of its stress-strain curve in the elastic deformation region: A stiffer material will have a higher elastic modulus.

IV. CONCLUSION

The compressive strength of concrete was slightly increased when 10% of pond ash was replaced by cement when compared to the conventional concrete mix. The modulus of elasticity of concrete was slightly increased when 10% of pond ash was replaced by cement when compared to the conventional concrete mix. Adding more than 10% of pond ash replaced by cement at concrete reduce its strength and increase the workability of concrete.

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