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Utilization and Experimental Investigation on Fly Ash in Concrete as Partial Replacement of fine Aggregate

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ABTRACT,
Concrete is a non-detachable module of construction, and the construction industry is a fast-growing sector to match current trends in industrialization and infrastructure development. Portland cement is the primary binder in concrete, and its manufacture contributes significantly to greenhouse gas emissions linked to global warming and climate change. Concrete cubes, cylinders, and beams of M-60 grade were cast and tested to evaluate numerous qualities of concrete such as workability, compressive strength, flexural strength, and split tensile strength test during these trial examinations. The test findings demonstrate that Fly Ash can be used to partially replace cement up to 10% by weight without causing significant strength loss.,So it can be say that Fly Ash effectively used as Biding material in concrete mix. The use of Fly Ash reduces the dependence of cement manufacture as well as cost of construction,
KeyWord-FlyAsh, workability, compressive strength,flexural,strength

I. INTRODUCTION

1.1 Role of Fly Ash in Concrete

Fly debris is a non-burnable, inorganic byproduct of coal-fired power plants. Carbon is burnt off as coal is singed at high temperatures, and the vast majority of mineral impurities are carried by the vent gas in the form of debris. Fly debris is a pozzolanic substance that has no cementitious value but will synthetically respond with calcium hydroxide at room temperature to form compounds with cementitious capabilities in a finely separated structure and in the presence of dampness.

Fly Ash

II. LITERATURE REVIEW

Strength Properties of Fly Ash Concrete

HalitYazc quantified pulverised fly ash (FA), pulverised granulated blast furnace slag (PS), and silica fume (SF) with the addition of Portland cement (PC) (2007). At specific ratios, PC was replaced with FA or PS. The aggregates in the mixtures were basalt and quartz powder. The specimens were cured using three distinct procedures (standard, autoclave, and steam). According to the results of the tests, high-volume mineral admixtures can produce high-strength concrete. These mixes have a compressive strength of over 170 MPa.. It seems that these mixtures can also be used for reactive powder concrete (RPC) production
with some modifications.
Self-compacting concrete (SCC) demands large amount of powder content and fines for its cohesiveness and ability to flow without bleeding and segregation. BinuSukumar et al (2007) in their investigation, part of this powder is replaced with high volume fly ash based on a rational mix design method. SCC mixes are prepared for different grades ranges from 30 to 70 MPa with all required rheological characteristics such as flow ability, filling ability, passing ability and segregation resistance. It was observed that the rate of gain in strength for different grades of SCC is slightly

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3. OBJECTIVE

- The mechanical properties of control concrete of M-60 grade at various percentages of fly ash as a partial replacement of cement were investigated over the course of 7 days, 28 days, and 56 days.
- The goal of this research is to find alternative materials that can completely or partially replace naturally accessible materials in construction.
- The major goal of this research is to reduce the use of conventional concrete materials.

III. EXPERIMENTAL INVESTIGATIONS

Material used in Experiment

- Cement
- Aggregate (Coarse Sand)
- Fly Ash
- Natural Sand
- Water

FLOW CHART OF PROPOSED METHODOLOGY

Collection ofrequiredmaterialssuch asFly ash , Cement,Fine aggregate,CoarseaggregateandWater

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ConcreteMixProportions

⇩

PreparationofConcreteMix

⇩

Casting of SamplesforTesting

⇩

Curing of ConcreteSamples

⇩

Testing of Specimens

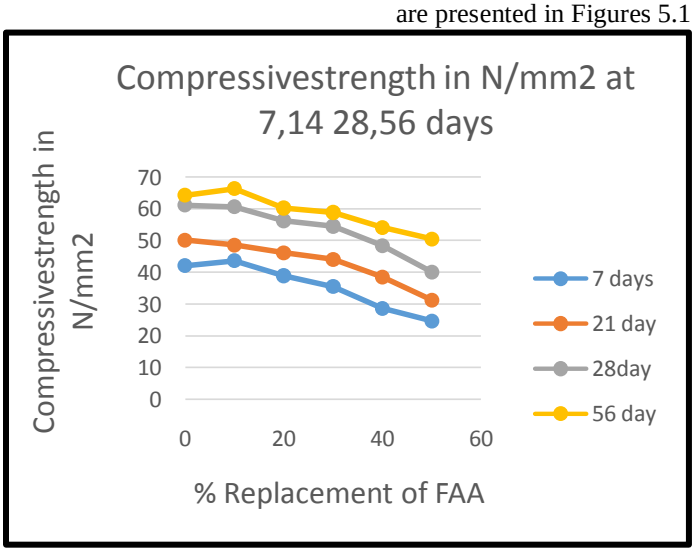
⇩

AnalysisofResults

IV. RESULT

5.1HARDNESS TEST OF CONCRETE CUBE COMPRESSIVE STRENGTH

The cube compressive strength results at the various ages such as 7, 21, 28 ,56 days for water-binder ratios 0.36 and at the replacement levels 10%,20%,30%,, 40%,50%, are presented in are presented in Figures 5.1



From the test results it was observed that the maximum compressive strength is obtained for fly ash mix FA-10 with 10 % fly ash and for water-binder ratio 0.36 at all ages. With high Pozzolanic content in the form of fly ash of about 50% at the age of the 56 days comparable results with control

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concrete is observed but it was not the same at the earlier ages because of three features of the pozzolanic reaction. First, the reaction is slow; therefore, the rate of heat liberation

V. CONCLUSION

(I) Strength Studies

With the increase in age, the strength development is more prominent for the fly ash mixes and comparable with control mix. The percentage reduction of compressive strength of the fly ash mix from the control mix at the age of 7 days is in the range of 10-46 % but at the age of 56 days it is 2-18%.

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