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## **Experimental Study of Alternative Cementing** Material in Concrete

Vishvajeet Dhanawade<sup>1</sup>, Vishal Naikwade<sup>2</sup>, Vikrant singh<sup>3</sup>, Prof.Milind D Darade<sup>4</sup>

Students, Department of Civil Engineering, Dr.D.Y.Patil School of Engineering Technology, Pune,

Maharashtra, India<sup>1,2,3,</sup>

Professor, Department of Civil Engineering, Dr.D.Y.Patil School of Engineering Technology, Pune,

Maharashtra, India<sup>4</sup>

**ABSTRACT**- Concrete is typically the most massive individual material element in the built environment. Concrete primarily comprises of Portland cement, aggregates and water. Cement is the vital ingredient of concrete Although, Portland cement typically comprises only 12% of the concrete mass, it accounts for approximately 93% of the total embodied energy of concrete and 6% to 7% of the global  $CO_2$  emissions. Every ton of cement produced liberates about 1 ton of carbon dioxide, and the cement industry is responsible for almost 5% of the total global industrial energy consumption.

A high-strength concrete is always a high-performance concrete, but a high-performance concrete is not always a high-strength concrete. Durable concrete specifying a high-strength concrete does not ensure that a durable concrete will be achieved. It is very difficult to get a product which simultaneously fulfills all of the properties. So the different pozzolanic materials like Ground Granulated Blast furnace Slag (GGBS), Silica Fume, Rice Husk Ash, Fly Ash, High Reactive Metakaolin, are some of the pozzolanic materials which can be used in concrete as partial replacement of cement, which are very essential ingredients to produce high performance concrete. It is very important to maintain the water cement ratio within the minimal range, for that we have to use the water reducing admixture i.e. superplasticizer, which plays an important role for the production of high performance concrete. So I herein this project will test on different materials like Ground Granulated Blast Furnace Slag and fly ash to obtain the desired needs. Finally I will use different percentage of fly ash & GGBS with the replacement of cement and concrete will be casted. Compressive test, splitting tensile testwill be conducted on the prepared mortar cubes, cylinders.

A reasonable solution for these problems without sacrificing its mechanical and durability properties. By using Industrial wastes, such as GGBS, fly ash are being used as supplementary cement replacement materials

**KEYWORDS**: Text detection, Inpainting, Morphological operations, Connected component labelling.

#### I. INTRODUCTION

Concrete usage around the world is second only to water. Ordinary Portland Cement (OPC) is conventionally used as the primary binder to produce concrete. The climate changes due to global warming and environmental protection has become major concerns. The global warming is caused by the emission of greenhouse gases, such as carbon dioxide, to the atmosphere by human activities. The extent of energy required to produce OPC is only next to steel and aluminium. Demand for concrete as construction material is on the increase and so is the production of cement. The production of cement increasing about 3% annually. The cement industry is held responsible for the carbon dioxide emission, because the production of one ton of Portland cement emits approximately one ton of carbon dioxide into atmosphere. Among the greenhouse gases, CO2 contributes about 65% of global warming. Furthermore, it has been reported that the durability of OPC concrete is under examination, as many concrete structure especially those built in corrosive environments start to deteriote after 20 to30 years, even though they have been designed for more than 50 years of service life.

Concrete is typically the most massive individual material element in the built environment. If the embodied energy of concrete can be reduced without decreasing the performance or increasing the cost, significant environmental and economic benefits may be realized. Concrete is primarily comprised of Portland cement, aggregates, and water. Although Portland cement typically comprises only 12% of the concrete mass, it accounts for approximately 93% of



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the total embodied energy of concrete and 6% to 7% of the worldwide CO2 emissions. Some remedial measures can be taken to minimize some bitter properties of concrete.

The environment must be protected by preventing dumping of waste materials in un-controlled manners. On the other hand, the abundant availability of fly ash worldwide creates opportunity to utilize this by-product of burning coal, as a substitute for OPC to manufacture concrete.

Fly ash (FA) or pulverized-fuel ash (PFA) is a pozzolanic material that is used in cement-based materials to enhance long-term strength, workability, resistance to sulfate attack and durability in concrete. When harvested from electric power generation plants, FA can exhibit high pozzolanic activity because it is formed from the burning of pulverized coal (Haque and Kayali, 1998). This industrial non-hazardous waste results from the burning off of volatile matter and carbon in coal due to ignition in the furnace, which then helps the mineral impurities in the coal (e.g., feldspar and clay) to fuse in suspension and float out with the exhaust gases. This process is followed by the cooling and solidification of the fused material into what it is called fly ash

The Ground Granulated Blast Furnace Slag is a by-product of iron manufacturing industry. Iron ore, coke and limestone are fed into the furnace and the resulting molten slag floats above the molten iron at a temperature of about 15000C to 16000C. The molten slag has a composition of about 30% to 40% SiO2 and about 40% CaO, which is close to the chemical composition of Portland cement. After the molten iron is tapped off, the remaining molten slag, which consists of mainly siliceous and aluminous residue is then water-quenched rapidly, resulting in the formation of a glassy granulate. This glassy granulate is dried and ground to the required size, which is known as Ground Granulated Blast Furnace Slag (GGBFS).

The production of Ground Granulated Blast Furnace Slag requires little additional energy as compared with the energy needed for the production of Portland cement. The replacement of Portland cement with GGBFS will lead to significant reduction of carbon dioxide gas emission. It is therefore an environmentally friendly construction material.

#### II. RELATED WORK

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#### **METHODOLOGY:**

SELECTING SAMPLE WITH THE BEST CHARACTERISTICS MIX DESIGN OF CONCRETE WITH BEST SAMPLE PREPARATIONS AND MIXING OF CONCRETE TESTING OF CONCRETE ANALYSIS OF RESULT

#### **EXPERIMENTAL RESULTS**

For compressive strength test and tensile strength test of concrete, the samples is prepared with Sand, course aggregate, cement and water .Then for testing, cement is replaced by cementing material like fly ash and GGBS

3cubes and 3cylinders are casted for each percentage of fly ash and GGBS content as 10%,20%, and 30% machStandard metallic cube moulds (150\*150\*150 mm) were casted for compressive and split strength. A table vibrator was used for compaction of the hand filled concrete cubes.



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| Table No.4.11-Com | pressive strength of | concrete by re | placing 20% of GGBS  |
|-------------------|----------------------|----------------|----------------------|
|                   | pressive strength or | concrete of it | placing 2070 of OODD |

| Curing Period           | 7 days | 7days | 7days | 28 days | 28 days | 28 days |
|-------------------------|--------|-------|-------|---------|---------|---------|
| Cube Mark               | G1     | G2    | G3    | G4      | G5      | G6      |
| Uitimate Load           | 699    | 710   | 756   | 780     | 800     | 766     |
| Compressive<br>Strength | 31.06  | 31.55 | 33.6  | 34.66   | 35.55   | 34.04   |

Table No.4.12-Tensile strength of concrete by replacing 20% of GGBS

| Curing Period    | 28 days | 28 days | 28days |
|------------------|---------|---------|--------|
| Cube mark        | Gt1     | Gt2     | Gt3    |
| Ultimate Load    | 330     | 317     | 333    |
| Tensile Strength | 2.334   | 2.242   | 2.355  |

Table No.4.13-Compressive strength of concrete by replacing 30% of GGBS

| Curing Period           | 7 days | 7days | 7days | 28 days | 28 days | 28 days |
|-------------------------|--------|-------|-------|---------|---------|---------|
| Cube Mark               | G1     | G2    | G3    | G4      | G5      | G6      |
| Uitimate Load           | 690    | 705   | 766   | 800     | 789     | 810     |
| Compressive<br>Strength | 30.66  | 31.33 | 34.04 | 35.55   | 35.06   | 36.00   |

Table No.4.14 -Tensile strength of concrete by replacing 30% of GGBS

| Curing Period    | 28 days | 28 days | 28days |
|------------------|---------|---------|--------|
| Cube mark        | Gt1     | Gt2     | Gt3    |
| Ultimate Load    | 330     | 310     | 335    |
| Tensile Strength | 2.334   | 2.192   | 2.369  |

#### III. CONCLUSION

The specimens were demoulded after 24 hours and subsequently immersed in water for different age of testing. For each age three specimens were tested for the determination of average compressive strength

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