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EXPERIMENTAL STUDY ON ECO- FRIENDLY CONCRETE

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Abstract

Eco- Friendly material in concrete to make the system more and more sustainable. There are many choices of selection of material in any type of constructions. Fly ash is not highly reactive; the heat of hydration can be reduced though fly ash. Industrial waste such as iron waste, fly ash. to reduce the consumption of natural resources and energy and pollution of the environment. So by reuse of the industrial waste material we reduced impact on environment and also reduce disposal problem of industries. The concrete mixture were produced which tested and compared by conducting compressive test and split tensile test for 7 day, 14 day and 28 days.

1. Introduction

The concrete is made with concrete wastes which are eco-friendly so called as Green concrete. The other name for green concrete is resource saving structures with reduced environmental impact **for e.g.** Energy saving, Co^2 emissions, waste water. Aggregates are the main constituent of concrete. Due to continuously mining the availability of aggregates has emerged problems in recent times. To overcome this problem, there is need to find a replacement to some extent. Nowadays, there is a solution to some extent and the solution is known as "Green Concrete". Green concrete has nothing to do with color. Green concrete is also cheap to produce because, waste products are used as a partial substitute for cement, charges for the disposal are avoided, energy consumption in production is lower, and durability is greater.

Further, by replacing cement with fly ash, micro silica in larger amounts, to develop new green cement and binding materials, increases the use of alternative raw materials and alternative fuels by developing or improving cement with low energy consumption. At each stage of the life cycle of the construction, it increases ease and quality of life, while minimizing the negative environmental impacts and increasing the economic sustainability of the construction. Any infrastructure designed and constructed in a sustainable way minimizes the use of resources through the whole life cycle of the construction process in which the green concrete play a vital role in achieving the sustainableconstruction.

2. Materials

2.1. Cement

Cement is a binding material which possess very good and cohesive properties which make it possible to bond with other materials to form a compact mass. Ordinary Portland cement is the most commonly used cement for general engineering works. The specific gravity of all grades namely 33, 43 and 53 grades. In this project Ordinary Portland Cement of 53 grades is used for experimental work. Initial and final setting time of the cement was 30 minutes and 600 minutes.

2.2. Fine Aggregate

The fine aggregate used was locally available river sand without any organic impurities and conforming to IS: 383 – 1970. The fine aggregate was tested for its physical requirements such as gradation, fineness modulus, specific gravity and bulk density. A concrete can be made from sand consisting of rounded grains as good as form that in which the grains or granular.

2.3 Coarse Aggregate

Coarse aggregate for structures consists of material within the range of 5mm to 150mm size.

Rocks having water absorption value greater than 3% or specific gravity of less than 2.5 are not considered suitable for mass concrete. However, in practice mixes of same workability for round shaped aggregates required less water than angular shaped aggregates.

2.4 Water

Water is an important ingredient of concrete as it activity participates in the chemical reaction with cement and potable water available in laboratory with pH value of not less than 6.5 and not more than8.5 ,conforming to the requirement of IS 456 2000 were used for mixing concrete and curing the specimen. The water which is fit for drinking should be used for makingconcrete.

2.5 Fly Ash

Fly ash is a byproduct from burning pulverized coal in electric power generating plants. During combustion, mineral impurities in the coal (clay, feldspar, quartz, and shale) fuse in suspension and float out of the combustion chamber with the exhaust gases. As the fused material rises, it cools and solidifies into spherical glassy particles called fly ash. Fly ash is collected from the exhaust gases by electrostatic precipitators or bag filters.

(Fig.1.Fly Ash)

2.5.1 Characteristics of Fly Ash

- Higher ultimate strength.
- Increased durability.
- Improved workability.
- Reduce shrinkage.

2.6 Iron Waste

In each industries wastes are available in form of steel scraps are yield by lathe machines in process of finishing of different machines parts and dumping of these wastes in the barren soil contaminating the soil and ground water that builds an unhealthy environment.

(Fig.2.Iron Waste)

2.6.1 Properties of Iron Waste

S.No	Properties	Values
1	Cross section	Straight and deformed
2	Diameter(mm)	0.3-0.75
3	Length(mm)	25-45
4	Specific gravity	7.85

3.Concrete Mix Design

The concrete used in this research work was made using Binder, Sand and Gravel. The concrete mix proportion was 1:1.5:3 by weight 2.4. Casting of samples Cubic specimens of concrete with size 150 x 150 x 150 mm were cast for determination of all measurements. Three mixes were prepared using 60% replace coarse aggregate by Iron waste. The concrete was mixed, placed and compacted in three layers. The samples were demoulded after 24 hours and kept in a curing tank for 7, 14 and 28 days as required. The Compacting Factor apparatus was also used to determine the compacting factor values of the fresh concrete in accordance with BS 1881: Part 103 (1983). 2.5. Testing of samples the compressive strength tests on the concrete cubes were carried out with the COMTEST Crushing Machine in the laboratory. This was done in accordance with BS 1881: Part 116 (1983). The sample was weighed before being put in the compressive test machine.

4.**Testing of samples**

The compressive strength tests on the concrete cubes were carried out with the COMTEST Crushing Machine at laboratory. This was done in

accordance with BS 1881: Part 116 (1983). The sample was weighed before being put in the compressive test machine. The machine

automatically stops when failure occurs and then displays the failure load.

5.Result and Discussion

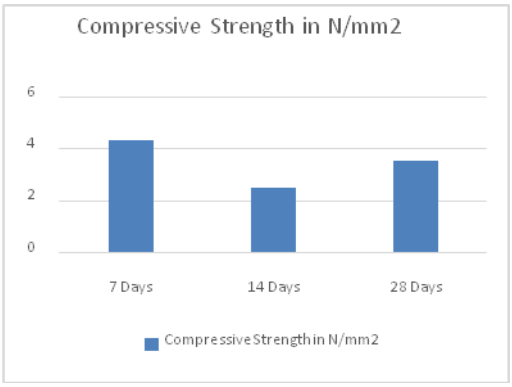
5.1. Result of compressive strength at different curing days

Compression test is the most common test conducted on harden concrete, partly because it is an easy test to perform, and partly because most of the desirable characteristics properties of concrete are qualitatively related to its compressive strength.

Sometimes, the compression strength of concrete is determined using parts of a beam tested in flexure. The end parts of beam are left intact after failure inflexure and since the beam is usually of square cross section, this part of the beam could be used to find out the compressive strength.

Table 1: Compressive Strength Test Result

Days	Compressive Strength in N/mm²
7	10.8
14	12.1
28	15.9



6 CONCLUSION

There is a need for the sustainable construction. Thus for achieving sustainable construction concept of green concrete is adopted. Green concrete technology is one of the major steps that a construction industry can implement to achieve sustainable construction with various means as discussed above. With Green concrete Technology, we can save the natural materials for future use or the generations to come and sustain it for good amount of time. With the time, the virgin material will deplete and so the cost of the material will increase which will add to more cost for the construction but if we use waste materials for construction the virgin materials will become a sustainable material and as well the cost will be reduced. With waste material as an alternative we can help reduce the environmental problems and protect the naturally available materials for future generations as well. Green concrete has reduced environmental impact with reduction of the concrete industries CO_2 commissions by 30%. Green concrete is having good thermal and fire resistant. In this concrete recycling use of waste material such as ceramic wastes, aggregates, so increased concrete industry use of waste by 20%.

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