



EXPERIMENT ON CONCRTE CONATAINING ACTIVATED CARBON

Prof. GAURAV VISPUTE¹, GOVARDHAN SURYAWANSHI², SURNAR AKASH³, ANKUSH TIDKE⁴

¹Professor, Dept. of Civil Engineering, Dr. D. Y. Patil School of Engineering and technology, Lohegaon, Pune, India

²³⁴Student (U.G.) Dept. Of Civil Engg. Dr. D. Y. Patil School of Engineering and technology, Lohegaon, Pune, India

ABSTRACT :

Concrete is a versatile material having many advantages. Hence it is the most widely used material in the construction industry. Many researchers made attempts to use waste materials with the objective of eliminating the disposal problems and at the same time improving the properties of concrete. An attempt has been made to improve the compressive strength of concrete with activated carbon, fly ash. In this work, the concrete mix was prepared by replacing cement by fly ash and activated carbon. The compressive strengths of cement were evaluated after 28days of curing. It is observed that the concrete mix added with of activated carbon exhibited the maximum strength. The maximum increase in the strength was found to be 25% more than that of the concrete without Activated Carbon.

Keywords: Activated Carbon, Fly-ash, concrete ,

1. INTRODUCTION :

One of the widely and popularly used construction materials is concrete. Quality of human civilization . In terms of infrastructure, habitation and transportation had greatly been affected by this construction Material. Cement concrete is commonly used in buildings and other important engineering works where strength and durability is of prime importance. Its huge popularity is a consequence of several advantages, such as general availability, wide applicability and high compressive strength. These advantages are also accompanied by a great environmental burden. At present, for a variety of reasons, the concrete construction industry is not sustainable. Firstly, it consumes huge quantities of virgin materials which cannot be remained for the next generations. Secondly, the principal binder in concrete is Portland cement, the production of which is a major contributor to greenhouse gas emissions that are implicated in global warming and climate change. The billions of tons of raw materials mined and processed each year leave a mark on the environment. The environmental load of concrete can be reduced by the partially replacement of Portland cement with other cement alternatives or additives. These Cement replacing materials could be fillers or waste products.

ACTIVATED CARBON:

Activated carbon is used to purify liquids and gases in a variety of applications, including municipal drinking water, food and beverage processing, odour removal, industrial pollution control. Activated carbon is produced from carbonaceous source materials, such as coconuts, nutshells, coal, peat and wood. Activated carbon, sometimes called activated charcoal. Activated carbon is a preferred adsorbent for the removal of micro pollutants from the aqueous phase. It is formed by daily products of nutshells, reservoir purifiers, filter brains etc. Different classifications of activated carbon include: powdered activated carbon, granular activated carbon, Extruded activated carbon, Bead activated carbon, Impregnated carbon and Polymer coated carbon etc.

Activated carbon is made by being placed in a tank without oxygen and subjecting it to extremely high temperatures, 600-900 degrees Celsius. Afterwards, the carbon is exposed to different chemicals, commonly argon and nitrogen, and again placed in a tank and superheated from 600-1200 degrees Celsius.

ADVANTAGES :

Advantages of activated carbon

- Activated carbon is extensively applied in various industries such as wastewater treatment, gas pollution control, food production, and chemical processes due to its low cost. It provides a big surface area and a high porosity.
- Activated charcoal is sometimes used to help treat a drug overdose or a poisoning. When you take activated charcoal, drugs and toxins can bind to it. This helps rid the body of unwanted substances. Charcoal is made from coal, wood, or other substances.

FLY ASH :

Fly ash is a by product from burning pulverised 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. Fly ash is used as a supplementary cementation material (SCM) In the production of Portland cement concrete. A supplementary cementation material when used in conjunction with Portland cement contribute to the properties of the hardened concrete. Present days construction industries need faster development and also require high strength of concrete to facilitate the fast and economic construction. This demand of high early strength grain of concrete put forth the use of low w/c ratio.

Advantages of Fly ASH :

The advantages of fly ash concrete over the corresponding plain cement concrete are:

Improved workability

Lower heat of hydration

The increase in creep with fly ash content up to 15% is negligible

Increases the modulus of elasticity of concrete when concretes of the same strength with and without fly ash are compared

Superior resistance to freezing and thawing

Improved sulphate resistance

Lower water and air permeability

Lower leaching of lime liberated during hydrated of cement

Reduced alkali-aggregate reactions

Greater resistance to crack of aggressive water.

OBJECTIVES :

- To use waste material like activated carbon in concrete making.
- To test the material activated carbon in concrete.
- To check the material is economical for making construction concrete.
- To measure and compare strength parameters of concrete blocks.

SCOPE OF WORK :

- To study the various properties of activated carbon and fixed the proportion of activated carbon used in concrete.
- To test the concrete cube made up of by using activated carbon.
- Experimental analysis of material.
- Experimental results on different phase i.e. 7,14 and 28 days strength
- To check the cost of conventional concrete and by using activated carbon concrete
- To compare strength parameters without using activated carbon.

METHODOLOGY :

- Materials –
Cement (Ambuja Brand, Grade 53, OPC) Sand, Activated Carbon, fly ash
- Equipment's –
Tray, Spade, mould, trowel, Compression testing machine (CTM).
- Procedure –
Batching - Mixing - Moulding – Casting – Curing – Drying.
- Test to conduct –
 1. Slump Cone Test
 2. Compression Test .

Slump Cone Test :

Slump is the measure of concrete consistency and fluidity. It shows the flow and overall workability of freshly mixed concrete. Simply put, the higher the slump, the weaker the mix. Four-inch (4") slump is very common with normal weight concrete and is a good for pumping.

1. Clean the mould 2. Place the mould on a smooth, horizontal, rigid & non-absorbent surface centre of metallic tray. 3. Fill the mould with concrete to be tested in four layers, tamping each layer 25 times with the tamping rod, taking care that the strokes are evenly distributed over the cross section. 4. Remove the mould by one smooth vertical motion. The concrete subsides & this subsidence is called slump measure the slump in mm by using metric scale.

Compression Test :

Compressive strength is the ability of material or structure to carry the loads on its surface without any crack or deflection. The compressive strength of the concrete cube test provides an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not. Concrete compressive strength for general construction varies from 15 MPa to 30 MPa and higher in commercial and industrial structures. Compressive strength of concrete depends on many factors such as watercement ratio, cement strength, quality of concrete material, and quality control during the production of concrete, etc.

Type Of Mix	Percentage Replacement Of fly Ash & Activated Carbon	Compressive Strength In Mpa		
		7 Days	3days	28Days
Conventional Concrete	0	17.4	20.35	26.57
Replacement of cement with Fly Ash & Activated Carbon	20%FA+0.2% AC	23.57	26.64	32.75
	20% FA+0.4% AC	18.51	21.56	27.59
	20%FA+0.8% AC	20.22	23.30	29.44
	20%FA+1.6% AC	21.22	24.25	30.35

Conclusions :

Based on the experimental work, the following conclusion is drawn:

➤ An experimental investigation was carried to study the significance of the conclusion. The results M20 show that the addition of activated carbon for fly ash in the cement can improve compressive strength of the concrete.

➤ The strength increases with 20% fly ash to 1.2% of activated carbon cement highest 28th days compressive strength value 32.75 Mpa of the optimum value of significant. Incorporation of 20% fly ash and 0.4% activated carbon addition of mixes in the cement the 28th day compressive strength 26.48 Mpa. Based on above discussion combination of fly ash and activated carbon can improve compressive strength of concrete is more compared to reference specimen.

REFERENCES

1. Aldea, C.; and Shah, S. ;(2011) "Durability enhancements of cracked concrete by fibers" ACISpec. Publ., No.276, pp.1-14.
 2. Chowdhury, Investigations in to the role of Activated Carbon in a moisture blocking cement formulation, Journal of Thermal Analysis and Calorimetry, Vol 78 (2004) 215-226. [10]
 3. ChaocanZheng: Compressive strength and microstructure of activated carbon fly-ash cement composites, year (2017)
 4. Chang T.P., Shih J.Y., Yang K.M., 2007, Material properties of Portland cement paste with nano montmorillonite, Journal of Materials Science, 42(17), 7478-7487, DOI: 10.1007/ s10853-006-1462-0.
 5. [h5ps://en.wikipedia.org/wiki/Activated_carbon](https://en.wikipedia.org/wiki/Activated_carbon)
 6. [h5p://www.kuraray-c.co.jp/en/activecarbon/about/01.html](https://www.kuraray-c.co.jp/en/activecarbon/about/01.html)
 7. [h5p://aurocarbon.com/activated-carbon-granular.html](https://aurocarbon.com/activated-carbon-granular.html)
 8. [h5ps://www.hindawi.com/journals/tswj/2015/415961](https://www.hindawi.com/journals/tswj/2015/415961)
- Chowdhury, Investigations in to the role of Activated Carbon in a moisture blocking cement formulation, Journal of Thermal Analysis and Calorimetry, Vol 78(2004) 215-226.
- N.J.Krou, I.Batonneau-Gener, Belin, S.Mignard, I.Javierre, I.Dubois-Brugger, M.Horgnies, Reactivity of volatile organic compounds with hydrated cement paste congaing activated carbon, Building and Environment 87 (2015) 102-107.
- Venkata Krishna Chaitanya and Dr. Neeraja. D, Experimental study on strength assessment of concrete with partial replacement of activated carbon, International Journal of Advanced Scientific Technologies in Engineering and management Sciences (IJASTEMS-ISSN: 2454-356X) Volume,2, Issue 10, October 2016
- www.google.com

