POZZOLANIC BEHAVIOR OF FIBER INCORPORATED CONCRETE ON ITS STRENGTH PROPERTIES

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Abstract— *Ever since the term high-performance concrete was introduced into the industry, it had widely used in large-scale concrete construction that demands high strength, high flowability, and high durability. 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.*

Keywords—pozzolantic, flowabilit, hih durabilit, behaviour of fiber

1. INTRODUCTION

Fly ash, Ground Granulated Blast furnace Slag, Rice husk ash, High Reactive Metakaolin, silica fume are some of the pozzolanic materials which can be used in concrete as partial replacement of cement. A number of studies are going on in India as well as abroad to study the impact of use of these pozzolanic materials as cement replacements and the results are encouraging. The strength, durability and other characteristic of concrete depends on the properties of its ingredients, proportion of mix, method of compaction and other controls during placing and curing.

With the passage of time to meet the demand, there was a continual quest in human being for the development of high strength and durable concrete. The history of high strength concrete is about 35 years old, in late 1960s the invention of water reducing admixtures lead to the high strength precast products and structural elements in beam were cast in situ using high strength concrete. Since then the technology has come of age and concrete of the order of M60 to M120 are commonly used. Concrete of the order of M200 and above are a possibility in the laboratory conditions. The definition of high strength concretes is continually developing. In the 1950s 34N was considered high strength, and in the 1960s compressive strengths of up to 52N were being used commercially. More recently, compressive strengths approaching 138N have been used in cast-in-place buildings. The advent of prestressed concrete technology has given impetus for making concrete of high strength. In India high strength concrete is used in prestressed concrete bridges of strength from 35 MPa to 45 MPa. Presently (in 2000) Concrete strength of 75 MPa is being used for the first time in one of the flyover at Mumbai. Also in construction of containment Dome at Kaiga power project used HPC of 60MPa with silica fume as one of the constituent.

2. HIGH PERFORMANCE CONCRETE:

In recent years, the terminology "High-Performance Concrete" has been introduced into the construction industry. The American Concrete Institute (ACI) defines high-performance concrete as concrete meeting special combinations of performance and uniformity requirements that cannot always be achieved routinely when using conventional constituents and normal mixing, placing and curing practices. A commentary to the definition states that a high-performance concrete is one in which certain characteristics are developed for a particular application and environment. Examples of characteristics that may be considered critical for an application are:

- Ease of placement

- Compaction without segregation
- Early age strength
- Long-term mechanical properties
- Permeability
- Density
- Heat of hydration
- Toughness
- Volume stability
- Long life in severe environments

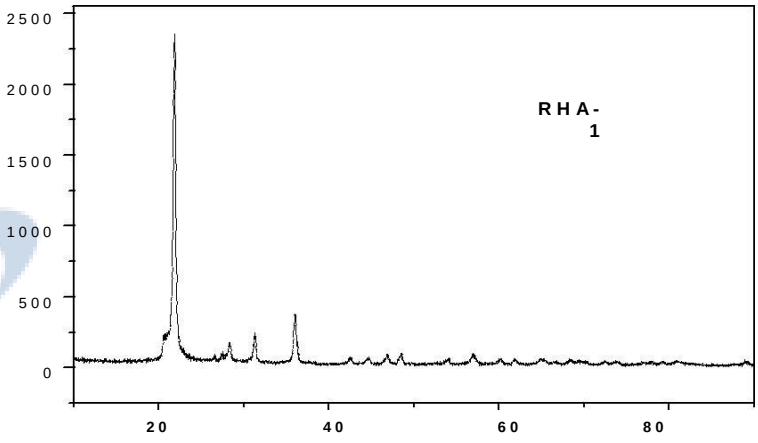
3. GROUND GRANULATED BLAST FURNACE SLAG:

Ground Granulated Blastfurnace slag (GGBS) is a by-product for manufacture of pig iron and obtained through rapid cooling by water or quenching molten slag. Here the molten slag is produced which is instantaneously tapped and quenched by water. This rapid quenching of molten slag facilitates formation of "Granulated slag". Ground Granulated Blast furnace Slag (GGBS) is processed from Granulated slag. If slag is properly processed then it develops hydraulic property and it can effectively be used as a pozzolanic material. However, if slag is slowly air cooled then it is hydraulically inert and such crystallized slag cannot be used as pozzolanic material. Though the use of GGBS in the form of Portland slag cement is not uncommon in India, experience of using GGBS as partial replacement of cement in concrete in India is scanty. GGBS essentially consists of silicates and Alumino silicates of calcium and other bases that is developed in a molten condition simultaneously with iron in a blast furnace. The chemical composition of oxides in GGBS is similar to that of Portland cement but the proportions varies.

4. SILICA FUME:

Silica fume also referred as microsilica or condensed silica fume is another material that is used as an artificial pozzolanic admixture. It is a product resulting from reduction of high purity quartz with coal in an electric arc furnace in the manufacture of silicon or ferrosilicon alloy. When quartz are subjected to 2000^0C reduction takes place and SiO vapours get into fuels. In the course of exit, oxidation takes place and the product is condensed in low temperature zones. In the course of exit, Silica fume rises as an oxidised vapour, oxidation takes place and the product is condensed in low temperature zones.

Results:

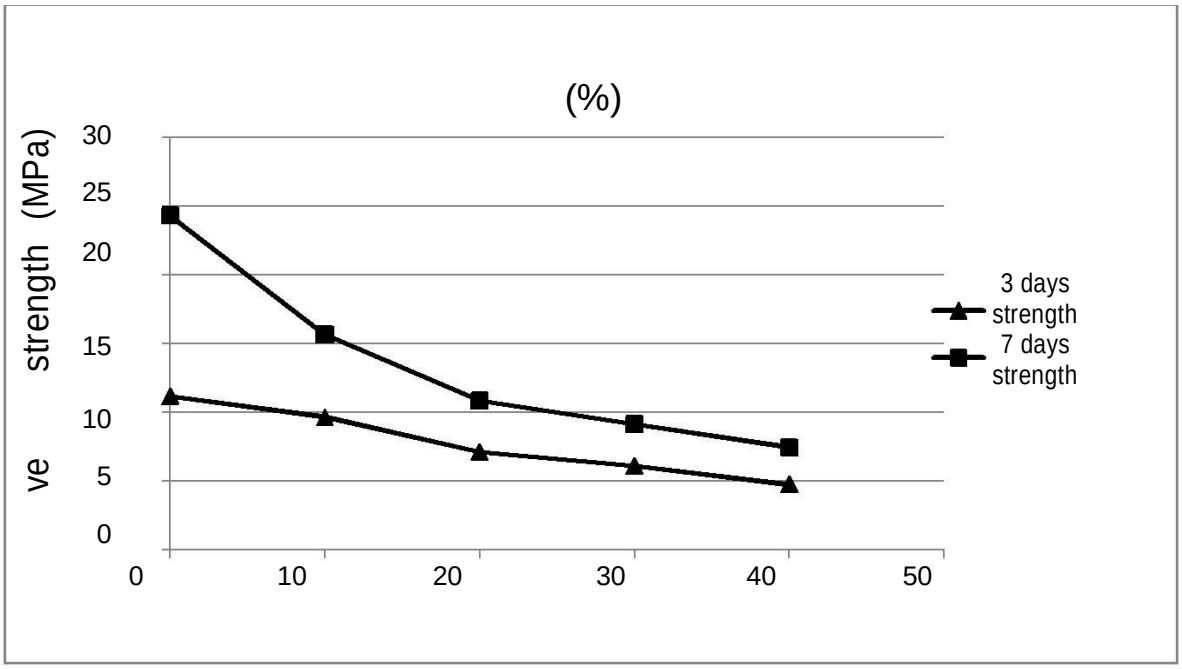


5. RESULTS AND DISCUSSION OF XRD TEST:

XRD was conducted on RHA-I, RHA-2, GGBSS and Silica fume, to idealize the different chemical composition of these pozzolanic material. Test was performed at an angle 45o with 2θ equal to 90o and different graphs are obtained, which were analysed using "X-pert High Score" software.

In case of GGBS from the graph it is inculcated that compound purely in amorphous form. Here we got the formation of Mg2Al2O4 corresponding to no. 74-1133 and Mg2SiO4 with no.74-1680. From the XRD graphs of RHA-I and RHA-II obtained from X-pert High Score software, it was visualised that RHA-I (black type) somehow is in crystalline form as compared to RHA-II (white type). But in both the form of rice husk ash we found crystabalite low temperature silica type with no. 76-0939 as to that of software. The graph shows silica fume also is in amorphous state with having compound SiO2 and CaO with nos. 03-0865 and 80-2146 respectively in the software used..

EFFECT OF GGBS IN COMPRESSIVE STRENGTH OF CEMENT:



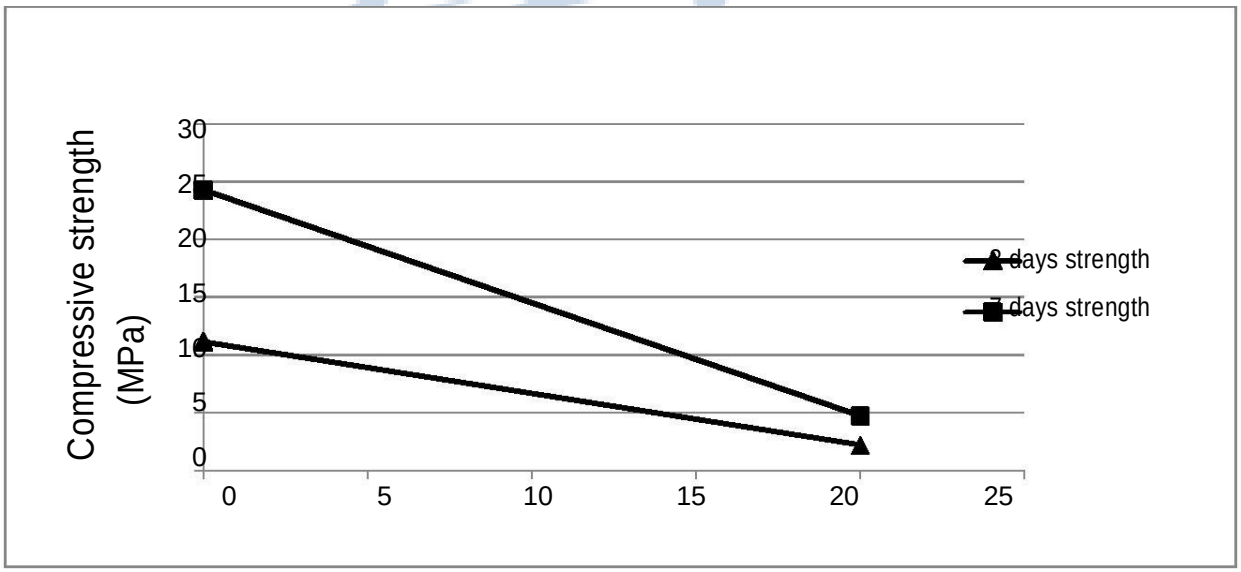


Fig. 4.8 Variation in Compressive strength of mortar with use of RHA I

6. CONCLUSION:

In case of Portland slag cement with the use of Recron fiber , the 28 days compressive strength at 0.2% fiber content the result obtained is maximum. The 28 days splitting tensile and flexural strength also increases about 5% at 0.2% fiber content to that of normal concrete. Further if fiber percentage increases then it was seen a great loss in the strength.

As the replacement of cement with different percentages with Silica fume increases the consistency increases.

With Portland slag cement keeping 0.2% Recron fiber constant and varying silica fume percentage the compressive, splitting tensile, flexural strength affected remarkably. Using 20% silica fume with 0.2% fiber percentage the 28 days compressive strength increases 7% more than concrete with 0.2% fiber only. 28days split tensile and flexural strength

increases further, about 12% and 10% that of normal concrete.

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