

A REVIEW PAPER ON APPLICATION OF SELF CURING AGENTS IN CONCRETE MIXES

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Abstract — Concrete is most widely used as construction material. Because it has good mechanical properties and durability. In present study review of the use super absorbent polymers in concrete has been taken to evaluate internal curing process. It also includes assessment of mechanical properties of high strength concrete blended with super absorbent polymers like PAA and PVA.

Keywords—polyacrylic acid (PAA), polyvinyl alcohol (PVA)

I. Introduction

Self-curing is the process by which the hydration of cement occurs because of the availability of additional internal water that is not part of mixing water^[1]. Self curing plays major role in developing the concrete pore structure & microstructure. Proper curing of concrete is most important to meet performance and durability requirements. Water soluble alcohol such as polyvinyl alcohol can be used as self curing agent in self-curing concrete.

Polyvinyl alcohol is produced by the manufacturers by the hydrolysis of a polyvinyl ester as vinyl alcohol does not exist in the free state, and in practice polyvinyl acetate is used

[2] [3]. Various grades of PVA are available which differ in molecular weight. PVA mixed in water from 0.5%, 1%, 2%, 3%, 4% & 5% by weight of cement. It was also found that 3% of PVA by weight of cement was optimum for M20 grade concretes for achieving maximum strength^[4]

Water soluble polymers such as PAA & PVA can be used as self curing agents in self curing concrete. PVA is formed from the chemical compound of polyvinyl acetate regularly by continuous process. PVA is fully degradable & dissolved quickly^[5]. Polyvinyl alcohol is an odorless and tasteless, translucent, white or cream colored granular powder. Typically a 5% solution of polyvinyl alcohol exhibits a pH in the range of 5.0 to 6.5. Polyvinyl alcohol has a melting point of 180 to 190°C^[6]. PAA belongs to the class of commercial polymers produced on large scale & widely used in various industries, agriculture & medicine. In this work attempt made to apply the PAA in constructing work to produce mortars, concretes & effect of it is evaluated. Polymers can be prepared through various techniques such as radical, cationic

and anionic polymerization.

II. Previous Work

1. B.Ajitha et.al (2017) Conducted study on , "Evaluation of properties of self curing concrete by using polyvinyl alcohol" From the study it was observed that The flexural strength for the concrete mix gradually increased with the increase in % of PVA added up to 0.24% of PVA . As percentage of PVA increase then flexural strength also increase.
2. Dr.M.Devi et.al (2017) Conducted study on "Flexural Behavior of Polyvinyl Alcohol Fiber Reinforced Concrete." In this study it was compared to conventional concrete poly vinyl alcohol fiber reinforced concrete specimens attains 48.5% higher compressive strength, 50.4% higher split tensile strength, 21.4% higher modulus of rupture.
3. Daliya Joseph et.al (2016) Conducted study on "Effect of Self Curing Agents on Mechanical Properties of Concrete." From the study it was observed that the percentage of PEG increases the slump value also increases. But in case of PVA the increase in percentage caused decrease in slump value. Increase in percentage of self curing agent resulted in decreasing in strength properties of concrete.
4. Putturu Monoj Kumar et.al (2016) Conducted study on "Strength characteristics of self curing concrete with different self curing agents." From the study it was observed that the optimum dosage of polyvinyl alcohol for maximum strength properties was found to be 0.25% for M25 grade of concrete.
5. Snehal Bhosale et.al(2016) Conducted study on "Experimental characterization of strength of self curing concrete." From the study it was observed that Use of polyvinyl alcohol up to 3 % (by weight if cement) from to be effective in strength development increase in percentage of polyvinyl alcohol results in decrease in the compressive strength.
6. M.V.Jagannadha Kumar(2012) Conducted study on "Strength characteristics of self-curing concrete ."From the study it was observed that The optimum dosage of PEG for maximum strengths (compressive, tensile and modulus of rupture) was found to be 1% for M20 and 0.5% for M40 grades of concrete.
7. A.Allahverdi et.al(2010) Conducted study on "Effect of polyvinyl alcohol on flexural strength and some important physical properties of Portland cement paste" From the study it was observed that the important role of W/C ratio on the effectiveness of the

polymer, so that relatively low W/C ratio can provide inverse effect. To achieve the maximum possible improvement in properties, both P/C and W/C ratio must be optimized together.

8. L.K. Aggarwal et al (2007) Conducted study on "properties of polymer-modified mortars using epoxy and acrylic emulsions" From the study it was observed that the addition of polymer to cement mortar improves workability and increases flexural and compressive strength.

9. Jae-Ho Kim et al (1999) Conducted study on "Structure and properties of poly(vinyl alcohol)-modified mortar and concrete." From the study it was observed that The addition of small amounts of PVA (up to 2 wt% PVA based on cement mass) caused several changes in the microstructure and properties of mortar and concretes. The air void contents were increased, which decreased the mass density.

III. Experimental Approach –

1. The concrete mix M60 will be investigated in the subsequent study.
2. It will be prepared with standard 53 grade Portland cement and polymers which are conformed to Indian standards.
3. Mix design will be carried out according to the IS 10262: 2009.
4. Continuously graded aggregate with nominal particle size of 20mm will be used.
5. Well graded quartzite sand, with a fineness modulus of 4.75mm.
6. All concrete mixes will be prepared in batches in a rotating mixer.
7. The batching sequence will consist of homogenizing the sand and coarse aggregate for 30 seconds, and then adding about half of the mixing water into the mixer and continuing to mix for one more minute.
8. After 5 minutes, the cement and polymer will be added and mixed for another minute.

Conclusion -

From the review following conclusions are drawn
The super absorbent polymers like PVA, PEG and PAA are suitably used as self curing agents in cement concrete mixes. The concrete up to M40 grade can be produced with self curing agents without compromising strength. Further experimental studies needed to find the optimum dosage of polymers that increases mechanical as well as structural properties of concrete above M40 grade .

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