Self Curing Posibilities of Concrete by Using Soluble Polymer

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ABSTRACT

Now a day's concrete is a necessary artifact and versatile construction material which is widely employed in housing industry everywhere the globe thanks to its compressible strength, on other hand water is that the key ingredient which forms a paste that binds the all material together but is becoming scarce and valuable material. Water plays a significant role in Curing of concrete which directly effect on durability and other performance necessities. Improper curing can affect the concrete performance and sturdiness. The concept of several self-curing agents to scale back water evaporation from concrete. And hence increases the water retention capacity of concrete compared to standard concrete. it had been found that water soluble polymers may be used as self-curing agents in concrete. The advantage of self -curing admixtures is more significant in desert areas where water isn't adequately available. during this study, polyacrylic acid, polyethylene glycol are going to be tried as self-curing agents and its effect on ordinary concrete will examined. It'll be mixed separately with ordinary concrete with varying percentage and its effect on properties of concrete are going to be examined.

Keywords: *Concrete, Self-Curing, Polyacrylic acid, Polyethylene glycol.*

INTRODUCTION

General Concrete is most generally used material in housing industry. It's one in every of the more expensive materials as a result it increases construction cost of projects. Now each day we are looking for the alternatives to conserve the constituents of concrete. Sand, metals are the materials naturally available and are depleting day by day thanks to their overexploitation. From invention it absolutely was found that we are able to replace sand and metal by using different artificial materials. But there's no alternative to interchange the water. Today we face water problem throughout globe. It's needed to conserve water that we use in various sectors. Economical use of water in processing different items in any industry would definitely end in water saving. In civil industry depending upon the character of labor the cement, fine aggregate, coarse aggregate and water are mixed in specific proportions to provide plain concrete. Plain concrete needs congenial atmosphere by providing moisture for a minimum period of 28 days permanently hydration and to achieve desired strength. Any laxity in curing will affect the strength and sturdiness of concrete. Self-curing concrete is one amongst the special concretes in mitigating insufficient curing thanks to human negligence paucity of water in arid areas, inaccessibility of structures in difficult terrains. The current study involves the employment of polyacrylic acid, polyethylene glycol and in concrete which helps in self-curing and helps in better hydration and hence increases strength. Curing plays a serious role within the development of concrete properties during construction. Curing is often accustomed describe the method by which cement concrete matures and develops hardened properties over time as a result of the continued hydration of the cement within the presence of sufficient water. Curing reduces water evaporation from the concrete and maintain satisfactory moisture content, especially during early ages, for continuation of the hydration process that's necessary for the event of cement microstructure. This may cause a much better quality cement paste and concrete and can help to realize the required properties. Curing of concrete is important immediately after the casting of concrete to avoid potential shrinkage, settlement, and thermal deformation at early ages. Properly curing is critical for concrete to satisfy the necessities of mechanical properties and sturdiness. Curing is that the process of

controlling the speed and extent of moisture loss from concrete during cement hydration. It's going to be either after it's been placed in position there by providing time for the hydration of the cement to occur. Since the hydration of cement does take time – days, and weeks instead of hours – curing must be undertaken for an inexpensive period of your time if the concrete is to realize its potential strength and sturdiness. Thanks to difference in chemical potential between the vapour and liquid phases, continuous evaporation of moisture takes place from external surface of concrete. The polymers added to the concrete mix mainly form hydrogen bonds with water molecules and reduce the chemical potential of the molecules which ends up in reduction of the pressure, Evaporation within the initial stage ends up in plastic shrinkage cracking and at the ultimate stage of setting it results in drying shrinkage cracking. Curing temperature is one amongst the most important factors that affect the strength development rate. At elevated temperature ordinary concrete losses its strength thanks to the formation of the cracks between two thermally incompatible ingredients, cement paste and aggregates. It absolutely was found that the good thing about using self-curing agents is to cut back water evaporation from concrete, thus increasing its water retention capacity compared there upon of conventional concrete. In concrete constructions, each kiloliter of concrete requires almost three cubic meters of water, most of which is employed for curing. The advantages of using self-curing concrete will thus be more significant in desert areas where water isn't adequately available and is dear. The sturdiness and performance of concrete depend mainly on the event of its microstructure and pore structure, that curing plays a significant role. With water resources becoming scarce in many countries, the employment of self-curing admixtures is becoming more and more important. Self-curing or internal curing may be a technique that may be wont to provide additional moisture in concrete for more practical hydration of cement and reduced self-desiccation. When concrete is exposed to the environment evaporation of water takes place and loss of moisture will reduce the initial water cement ratio which is able to lead to the unfinished hydration of the cement and hence lowering the standard of the concrete.

LITERATURE REVIEW

M.R. Geiker (2004) et al concluded that use of partially saturated lightweight aggregates (LWA) or the addition of superabsorbent polymer particles (SAP) can provide the extra curing water needed for cement hydration under sealed conditions. Autogenous shrinkage is reduced due to larger pores (within the LWA or fonned by the SAP particles themselves) being emptied than those typically emptied in cement paste during sealed hydration. Clearly, both the water content and its spatial distribution within the paste are important factors. An additional benefit of the internal curing approach autogenous shrinkage may be an increased degree of hydration and measure compressive strength at later ages, due to the increased and persistent availability of moisture. A.S. El-Dieb (2007) et al investigated use water-soluble polymers: polyethylene glycol (PEG) and poly acryl amide (PAM) as self-curing agents and its effect. Polyethylene-glycol (PEG) was used alone with a dosage of 0.02% by weight of cement. Poly acryl amide (PAM) was used in conjunction with PEG as a second alternative for self-curing agent. The dosage of PEG and PAM was 0.02% by weight of the cement, PEG dosage was 0.013% and that of PAM was 0.007%. Gobinath.R (2013) et al said that effect of admixture (PEG 4000) on compressive strength, split tensile strength and modulus of rupture by varying the percentage of PEG by weight of cement from 0% to 2% were used for M20. It was found that PEG 4000 could help in self curing by giving strength. Viktor Mechtcherine (2013) et al found that there was considerable decrease in autogenous shrinkage as a result of internal curing. The addition of SAP and some extra water led to a reduction of deformations at early ages by about 80 % when SAP 1 and 50 % when SAP 2 was used. The decrease in autogenous shrinkage at an age of 28 days was 44 % for the SAP 1- mixture and 32 % for the SAP 2-mixture in comparison to the ordinary concrete. The shape and size of the SAP particles may have a major influence on the strength values. The spherical SAP, which had also smaller particle sizes, led to higher strengths in comparison to the mixture with irregularly shaped and larger SAP particles. B. K. Tan (2014) et al said that the polymer composite starts to swell when immersed into water and reaches the highest water absorption percentage in the first 1 hour. The highest water absorption percentage was 273 and 251% for the composite with 2 and 10 wt% of poly (vinyl alcohol), respectively, in 24 hours. The high water absorbency could be due to the interaction of water with the hydroxyl group in the poly (vinyl alcohol) and fibers, similar to other reported works on cellulose composites. Interestingly, the poly (vinyl alcohol) in the composite only starts to dissolve very slowly over more than 7 days before the kenaf fibers started to dropout from the composite. Use of Polyvinyl alcohol (0.48% by the weight of cement) as self-curing agent Provides higher compressive, tensile as well as flexural strength than the Strengths of conventional mix. Increase in the Percentage of polyvinyl alcohol results in the reduction of weight

loss. Magda I. Mousa (2014) et al says that the use of self-curing agent in concrete effectively improves the physical properties compared with conventional concrete. On the other hand, up to 15% saturated leca was effective while 20% saturated leca was effective for permeability and mass loss but adversely affects the volumetric water absorption. Self-curing agent was more effective than self-curing agent leca. In all cases, both 2% and 15% leca were the optimum values. Higher cement content and/or lower water–cement ratio leads to more effective results of self-curing agents in concrete. Incorporation of silica fume into concrete mixtures enhances all physical properties. Manish Kumar Patel (2014) et al they used polyethylene glycol in conventional concrete as an admixture which helps for better hydration and hence the strength of concrete It was also found that 1% of both PEG600 and PEG1500 by weight of cement was optimum for M25 grade concrete for achieving maximum strength without compromising workability. The test result indicates that use of water soluble polymers in concrete has improved performance of concrete. K. Bala Subramanian (2015) et al used super absorbing Polymer SAP as internal curing agent. In study he used it with varying percentages (0.2% to 0.4%) in different grade of high strength concrete. Replacement of cement by silica fumes with 5%, 10% and 15% were also studied. It was found that replacement of silica fumes by 10 % gives more strength and durability when compared to others. Study concluded that strength development of High Strength concrete is more if the replacement percentage of silica fumes by 10% weight of cement but Rapid chloride permeability of the concrete decreases if the replacement percentage of silica fumes by 15% of weight of cement. The Strength of the concrete was increased significantly with increase of self-curing agent. i.e., concrete with 0.4% of PEG gives more strength than that with 0.2%, and 0.3%. Daliya Joseph (2016) et al investigated the effect of curing agents like PEG 4000 & PVA on strength properties by varying the percentage of PEG4000 and PVA by weight of cement 1.0%, 2% and 3%. They concluded that PEG4000 and PVA help in gaining the strength of conventional curing. It was also found that 1% of both PEG4000 and PVA by weight of cement was optimum for M30 grade concrete for achieving maximum strength without compromising workability. The test results showed that self-curing concrete is best option in places where water scarcity exists. S Sundararaman (2016) said that the strength and durability properties of concrete using water soluble Polyethylene Glycol (PEG 400) 0.5%, 1%, 1.5% and 2% as self-curing agent and 10% of silica fume in common using for M25 grade concrete. The compressive strength at 3 days, 7 days and 28 days have been obtained with normal curing and self-curing condition. It was found that a maximum compressive strength of 47.8 N/mm2 and split tensile strength 5.16 N/mm2 with 1% of PEG-400 was observed. The durability of self-curing concrete with PEG 400 when exposed to 10% of HCl, H2SO4 and Na2SO4 showed a promising effect. Thus the self-curing concrete ensures a remarkable effect on strength and durable property. Basil M Joseph (2016) said that the optimum dosage of PEG400 for maximum strengths (compressive, tensile and modulus of rupture) was found to be 1%. If dosage exceeds 1% there is a slight decrease in the strengths mentioned above. As percentage of PEG400 gets increased slump as well as compaction factor also gets increased.

METHODOLOGY

The experimental investigation has been performed to investigate about the strength of the self-curing concrete by adding poly ethylene glycol (PEG 400) at 0.2%, 0.3%, 0.4% by weight of cement. Concrete was obtained high strength by adding mineral admixture (Silica fume –SF) as a replacement of cement with varying percentages as 5%, 10%, and 15% and by increase the workability by mixing of chemical admixture (Super Plasticizer-Glenium B233). The optimum dosage of Super Plasticizer has been found by Marsh Cone test. In this experiment, one set of conventional cured high strength concrete and another set of self-cured high strength concrete were experimented. The following sets of tests were done to study the compressive, tensile, and flexural strength. The grade of concrete investigated is M 60, M 70, M 80. The subsequent tests such as compressive strength, split Tensile strength, Flexural strength, Rapid Chloride Permeability Test The experimental investigation has been performed to investigate about the strength of the self-curing concrete by adding poly ethylene glycol (PEG 400) at 0.2%, 0.3%, 0.4% by weight of cement. Concrete was obtained high strength by adding mineral admixture (Silica fume –SF) as a replacement of cement with varying percentages as 5%, 10%, and 15% and by increase the workability by mixing of chemical admixture (Super Plasticizer-Glenium B233). The optimum dosage of Super Plasticizer has been found by Marsh Cone test. In this experiment, one set of conventional cured high strength concrete and another set of self-cured high strength concrete were experimented. The following sets of tests were done to study the compressive, tensile, and flexural strength. The grade of concrete investigated is M 60, M 70, M 80.The subsequent tests such as compressive strength, split Tensile strength, Flexural strength, Rapid Chloride Permeability Test The

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The grade of concrete investigated is M 60, M 70, M 80.The subsequent tests such as compressive strength, split Tensile strength, Flexural strength, Rapid Chloride Permeability Test and Water absorptivity Test are carried out for conventionally cured High Strength Concrete and with High Strength Self Cured Concrete. The tests results were analysed and compared. and Water absorptivity Test are carried out for conventionally cured High Strength Concrete and with High Strength Self Cured Concrete. The tests results were analyzed and compared.

MATERIALS USED

a) Cement

b) Fine Aggregate

c) Coarse Aggregate

d) Water

e) Polyacrylic acid

f) Polyethylene glycol

OBJECTIVES:

1. The objective of the investigation is to use the water soluble polymer, Such as polyacrylic acid, polyethylene glycol and as self-curing agent and to decide the optimum dosage for different curing conditions under arid atmospheric conditions.

2. To compare the results such as compressive strength, split tensile strength, flexural strength of concrete by using self-curing agent with conventional concrete.

CONCLUSION

Conclusion: The slump of concrete 100mm indicates Medium Degree of workability.

The Specific Gravity of a given sample of course aggregate is found to be …2.63.

The Water Absorption of a given sample of course aggregate is found to be …1.5…. %

The Specific Gravity of a given sample of fine aggregate is found to be …2.6….

The Water Absorption of a given sample of fine aggregate is found to be …2…. %

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