

Comparative Study of Mechanical and Durability Properties on Self Curing Concrete

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Abstract—In this study, compressive strength and split tensile strength of concrete containing self-curing agent is investigated and compared with those of conventionally cured concrete. ..It was found that PEG 400 could help in self-curing by giving strength on par with conventional curing.. The various physical property evaluated are density, void content and water absorption behavior. From the experimental results, it is found that inclusion of fly ash increases the density of the composites. Voids increases with filler content. Water absorption for filled composites is higher than unfilled once.

Keywords—PEG, fly ash, density, void content, water absorption rate.

I. INTRODUCTION

Concrete is the most widely construction material across the world. Man consumes no any other material than water in such a huge quantity. Changing requirements for durability, safety and serviceability of structures push the development of concrete towards newer paths of exploration. Self-curing concrete is one such new exploration in the concrete world.

Normal concrete lacks in required strength and durability which are happened due to inefficient water curing. While after casting the concrete, the curing plays a crucial role in construction. From that they found 1% of PEG600 by weight of cement was optimum for M20 and M25 grade of concrete for achieve maximum compressive strength of 24.9MPa and 29.2 MPa for M20 and M25 respectively and split tensile strength were 3.3MPa and 3.8MPa respectively for M20 and M25 grade concrete. The author has used PEG600 as a self-curing agent in concrete. M20 and M25 grade of concrete are adopted for investigation. They added 0-2% of PEG600 by weight of cement.

While studying the mechanical properties, they found that the tensile strength increased as the amount of fly ash increased, up to a critical point. On the other hand, they found that the compressive strength of the composite increased continuously as the amount of fly ash increased. In addition, they reported that due to the pores present in the fly ash particles larger than 50 μm , the mechanical properties of the composite containing less than 90 μm fly ash was reduced. Hollow-shaped large fillers such as fly ash cause significant decreases in strength, due to the thinner and weaker walls of the particles. They concluded that composites with smaller particle size fly ashes showed significant improvement in mechanical properties. Against this background, an attempt has been made in this research work to develop micro-sized fly ash-based epoxy composites using simple hand lay-up technique and to study their physical behavior under controlled laboratory conditions.

II. MATERIALS AND METHODS

Material considered

It was found that 0.48% of poly vinyl alcohol by weight of cement provides higher compressive strength of 34MPa.

Tests conducted

The major challenge in construction industry now a days is the lack of availability of water. This problem can be reduced to a greater extent by replacing normally cured concrete with self-curing concrete. (1m³ of concrete requires 3m³ of water for curing).

To identify the effect of PEG on strength characteristics of SCC and to evaluate the influence of PEG on mechanical properties which can be investigated experimentally.

Sulphate attack

Sulphate attack on concrete is a mechanism which involves chemical breakdown in which sulphate ions attack the components of the cement paste. When sulphates combine with the C-S-H gel, they start to destroy the paste that holds concrete together. New compounds are formed, often known as ettringite. These cause the paste to crack, further damaging the concrete. It has been known that incorporating pozzolanic materials reduces the sulphate attack. These pozzolanas helps in converting the leachable calcium hydroxide into non leachable cementitious products, thus making the concrete impermeable.

TABLE I

CONCRETE MIX

Mix	Cement+FA	
Mix 1	Cement+20%FA	To find the optimum dosage of FA
MIX 2	Cement+30%FA	
MIX 3	Cement+40%FA	
MIX 4	Cement+30%FA+0.25%PEG400	To find optimum dosage of PEG400
MIX 5	Cement+30%FA+0.50% PEG400	
MIX 6	Cement+30%FA+0.75%PEG400	
MIX 7	Cement+30%FA+0.20%PEG1500	To find optimum dosage of PEG1500
MIX 8	Cement+30%FA+0.25%PEG1500	
MIX 9	Cement+30%FA+0.30%PEG1500	



III. RESULTS AND DISCUSSION

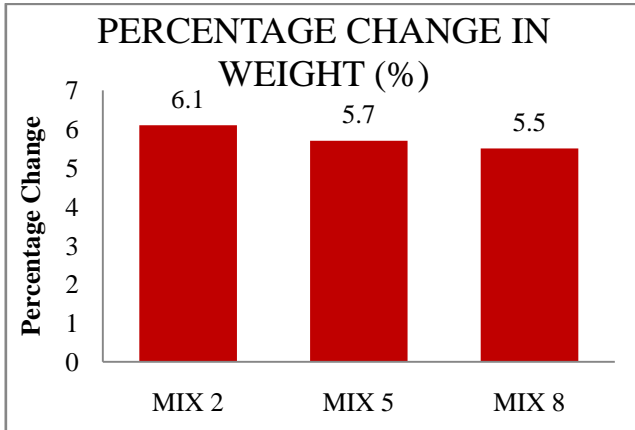


Fig. 1. Percentage change in weight under sulphate attack for 60 days.

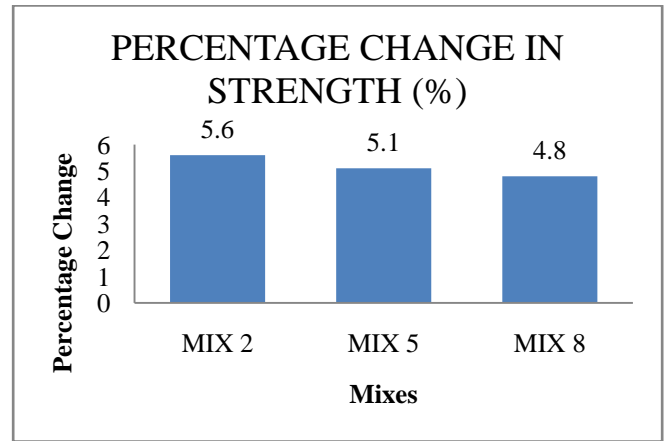


Fig. 3. Percentage change in weight and strength respectively

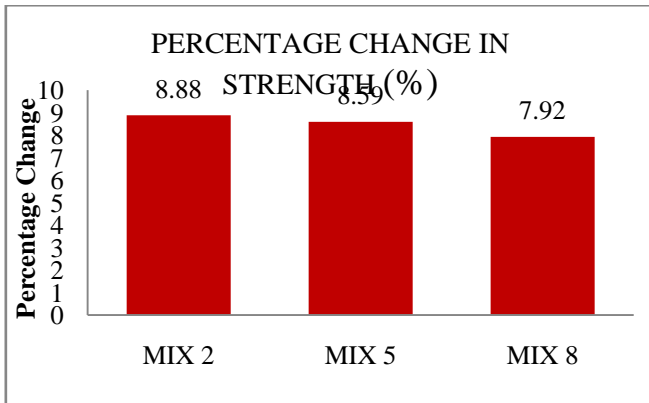


Fig. 2. Percentage change in strength under sulphate attack for 60 days.

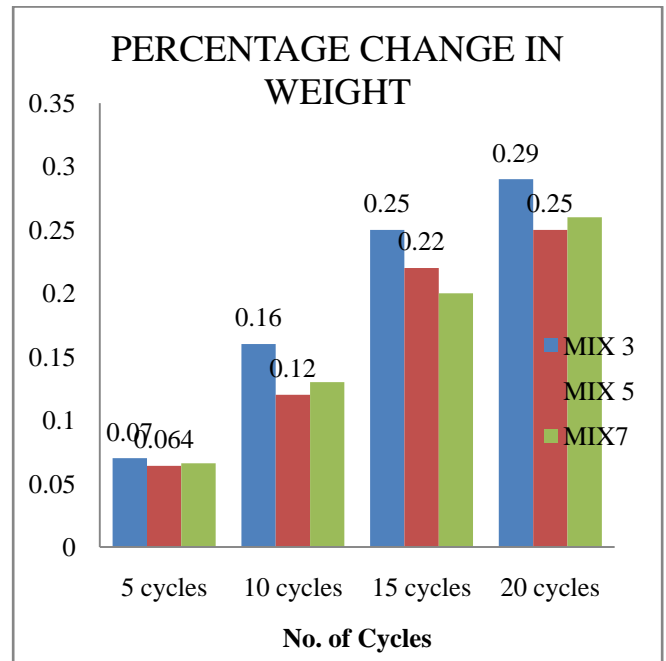
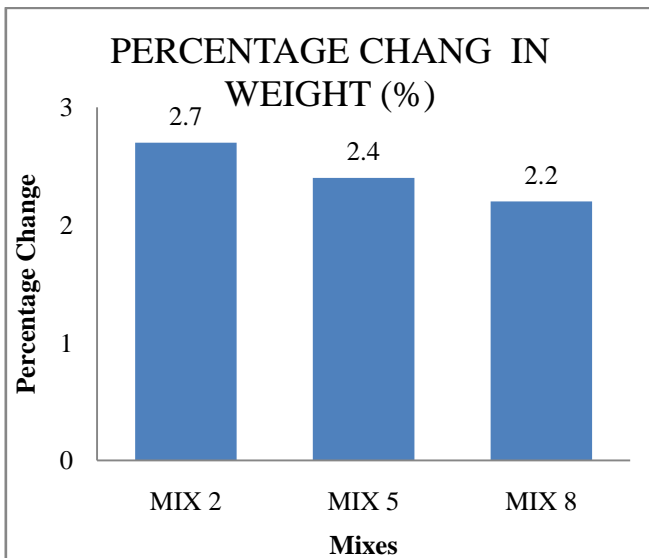


Fig. 4. Percentage change in weight.

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IV. CONCLUSIONS

Based on the experimental investigation on Self-curing concrete following conclusions can be drawn:

1. Conventional concrete containing fly ash 30% replacement had the highest strength hence considered as optimum dosage for M50 grade concrete.
2. From the durability test it is seen that the reduction in strength of conventional concrete is 10.62% and 11.16% compared to PEG400. Similarly, the reduction in strength of conventional concrete is 18.31% and 17.83% compared to PEG1500 under sulphate and alkali attack respectively. Hence self-cured concrete is better resistant to chemical attacks.
3. From ageing test it was found that, compressive strength of conventionally cured concrete decreases by 13.9% and 17.6% when compared to self-cured concrete with PEG 400 and PEG 1500 respectively.
4. The dosage of PEG is specific to the grade of the concrete. For the M50 grade concrete the optimum dosage found is 0.5% for PEG400 and 0.25% for

PEG1500. The increment in the dosage results in decrement of the compressive and split tensile strengths. The decrement is due to the increased water content in the concrete.

5. Self-curing concrete is the best solution for dry areas, sloppy constructions and where there is scarcity of water.

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