# ABSTRACT

Cement is a widely used versatile material in the area of construction. Engineering construction in all parts of the world is rapidly growing now. Meanwhile, the quality of constructing structures are going down as the monitoring during constructions is not upto the mark. This could also be resulted in the alteration of durability in concrete. For poor durability of concrete improper curing of concrete is one of the factors. Hence, the present study has been carried out to produce self-curing concrete preloaded with compacting agents. Curing of concretes provides the preservation of sufficient moisture in concrete at its initial stages to develop and maintain the desired properties. The purpose of using self-curing agent is to minimize the evaporation of water from concrete, and thereby enhance the water retention ability of the concrete than that of control concrete. From the literature, it is clear that, paper sludge can effectively be used as self-curing agent. Self-curing concrete plays a crucial role in the development of concretes microstructure and pore structure, and hence it will effectively influence its durability.

A very large amount of Portland cement is needed at present since, construction industries are increasing at a global level. Manufacture of Portland cement is an energy intensive process and emits huge amount of greenhouse gases into the atmosphere lead to the alteration of the earth's ecosystem. Various efforts are being practiced to conserve energy in terms of encouraging the use of industrial wastes such as Granulated Blast furnace Slag (GGBS) and Paper sludge (PS), which exhibit similar chemical properties as cement. In the present work, the solid waste materials from industries such as GGBS and PS were used as partial replacement of cement

for $M_{25}$ grade concrete to prepare all the test mixes, to find the optimum percentage of the replacement level to the cement with GGBS and paper sludge. In addition, an optimum percentage level of the paper sludge as self-curing agent has also been determined.

The entire research work carried out is divided into three distinct phases. In the first phase, tests on compressive strength, split tensile strength and flexural strength of $M_{25}$ grade concrete were conducted with the addition of 10%, 20%, 30%, 40% and 50% GGBS. From the experimental results, it was found that, upto 40% replacement of cement by GGBS, the compressive strength, split tensile strength and flexural strength values were comparatively higher than the control concrete values (water curing).

In the second phase the tests on compressive strength, split tensile strength and flexural strength of $M_{25}$ grade concrete with 5%, 10%, 15%, 20%, 25%, 30% and 40% PS were conducted. The results showed that, 10 to 25% of cement replacement by PS at 28 days have increased relatively higher than the control concrete for different self curing days (28, 60, 90, 120, 180 and 365 days) and it was optimum at 25% of cement replacement by PS.

In the third phase, $M_{25}$ grade concrete specimens were prepared by the addition of PS with various dosages of GGBS having an interval of 5% were subjected to compressive strength, split tensile strength and flexural strength for different curing days by self curing methods. The obtained results revealed that, partial replacement of cement with 15% of PS including 25% of GGBS had the better compressive strength, split tensile strength and flexural strength values when compared to control concrete.

In addition, the micro structural analyses have been carried out for specimens of optimum level using the Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD). The rate of hydration of PS and GGBS added

Self curing concrete have also been analyzed using Thermogravimetry and DSC (Differential Scanning Calorimetry). In addition, the durability tests viz., acid attack, sulphate attack, water absorption, water sorptivity and rapid chloride permeability have been conducted based on Indian standards.