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STUDY OF STRENGTH AND DURABILITY OF SUPER ABSORBENT POLYMER INTRODUCED CONCRETE

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Abstract - *The present study involves the use of SAP for crack sealing and self curing. The addition of SAP alters the various properties of concrete like increased workability, increased fire resistance and shrinkage resistance, etc. The self curing helps in better hydration of cement which leads to achieve higher later strength. When fly ash is used as a cement replacement, increased later compressive strength, increased resistance to alkali-silica reaction (ASR), less heat generation during hydration, increased pore refinement, decreased permeability, decreased water demand, increased workability and decreased cost. In the present study, SAP of 0.1%, 0.3% and 0.5% are added to fly ash (30%) replaced cement containing concrete mix. The main focus of this study is to compare results of hardened concrete of M30 concrete mix with SAP to conventional concrete by studying compressive strength and durability.*

***Key Words*: Concrete, Fly ash, Super Absorbent Polymer, Crack Sealing, Internal Curing**

1. INTRODUCTION

Super Absorbent Polymer is most advantageous in the field of agriculture, medical, waste management, etc. Due to this water entraining property later, researchers initiate the use of SAP as additive in concrete construction. The SAP used to block the water flow through cracks and voids[1]. Superabsorbent polymer can absorb and retain extremely large amounts of a liquid relative to their own mass. The total absorbency and swelling capacity are controlled by the type and degree of cross-linkers. Low-density cross-linked SAP has a higher absorbent capacity and swells to a larger degree and vice versa.

SAP is added to dry mix of concrete. When water is added to mix SAP absorbs water and retains it thereby increase in volume by 250 times. The retained water is converted into the form of gel which fills the voids created due to hydration and freeze-thaw effect. The water from concrete evaporated by increased heat of hydration which leads to formation of voids. Expansion and contraction of concrete creates large number of voids which leads to Shrinkage cracks[2].

Proper curing of concrete structure is necessary to meet best strength and durability requirements. Perfect curing cannot be done manually because of less availability of water and difficulty of height of curing at site. When water is needed for concrete is not readily available. The solution of this problem is self curing. Internal or self curing is achieved by adding of SAP to concrete. In the present study SAP of 0.1%, 0.3% and 0.5% is added to 30% flyash replaced concrete and comparative results were predicted for compressive strength, durability and SEM analysis.

2. EXPERIMENT

2.1. Materials Used: Material used in the present study as follows were cement(OPC), fly ash, fine aggregate (river sand passing through 4.75mm), coarse aggregate (well graded), SAP, and Water.

2.1.1 Cement: Ordinary Portland Cement of super grade confirming to IS 12269:2013.

2.1.2 Fly ash: Class C fly ash is designated in ASTM C 618 and originates from sub bituminous and lignite coals.

2.1.3 Fine Aggregate: Locally available river sand confirming to Grading zone II of IS 383 –1970.

2.1.4 Coarse Aggregate: Locally available quarry stone in good strength conforming to IS 383-1970.

2.1.5 Water: Portable water free from acidity and alkalinity.

2.1.6 SAP: Sodium Poly acrylate is a synthetic polymer used in cosmetics and personal care products in part because of its ability to absorb as much as 500 times its mass in water (Fig. 1). It is seen as a white powder when dry, but turns into a gel-like substance when wet, and is primarily used as a thickening agent.

Sodium polyacrylate procured from CHEMZEST, also known as water lock, is a sodium salt of polyacrylic acid with the chemical formula $[-CH_2-CH(COONa)-]_n$. The SAPs are crosslinked polymer which is made from the polymerization of acrylic acid blended with sodium hydroxide in the presence of poly-acrylic acid. The technical specification of SAP is categorized in Table 1.