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Comparative Study on Concrete by the Use of Recron 3s Fiber at Different Grades of Concrete

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Abstract - *Many countries are facing the problem with the lack of natural resources for the upcoming construction industry. The dependency on the natural aggregates is increasing day by day hence, artificially manufactured aggregates and artificial aggregates generated from industrial waste provide an alternative. Copper slag is a byproduct produced during the copper smelting and refining process. For this research work, Copper slag used as partial replacement to fine aggregate in concrete. In which compressive strength, split tensile strength and Flexural tests were carried out. Copper slag of proportions 0, 15, 30, 45, 60% was replaced with fine aggregate. In addition to that Acidic (H_2SO_4) and Sulphate (Na_2SO_4) behaviour of cubes was studied on weight-loss parameters. The behaviour of concrete in this was observed at 3, 7 and 28 days.*

1. INTRODUCTION

In olden days concrete is made up of cement, sand and aggregates, it gives good results but now a days the entire world is in search of cement replacements and supplements. The entire work is carried out on searching of secondary reinforcement like polypropylene fibre.

POLYPROPYLENE

Polypropylene is a 100% synthetic fibre which is transformed from 85% propylene. The monomer of polypropylene is propylene. Polypropylene is a by-product of petroleum.

STRUCTURE OF POLYPROPYLENE

Polypropylene (PP) is a thermoplastic. It is a linear structure supported the monomer CnH2n. It is manufactured from propylene gas in the presence of a catalyst like titanium chloride. Apart from that PP is a by-product from oil refining processes.

Most polypropylene used is extremely crystalline and geometrically regular (i.e. isotactic) opposite to amorphous thermoplastics, like polystyrene, PVC, polyamide, etc., which radicals are placed randomly (i.e. atactic).It is said that PP has an intermediate level of crystallinity between low density polyethylene (LDPE) and high density polyethylene (HDPE); On the opposite hand PP has higher working temperatures and tensile strength than polyethylene.

Uses of Polypropylene

Polypropylene is a major polymer used in nonwovens, with over 50% used for diapers or sanitary products

 Other uses include filters for air, gas, and liquids. Such applications could be seen in the house as water filters or air-conditioning-type filters.
 The high surface area and naturally oleophilic polypropylene nonwovens are ideal absorbers of oil spills with the familiar floating barriers near oil spills on rivers
 Polypropylene is also used in warm-weather clothing, which transports sweat away from the skin
 Polypropylene has been used in hernia and pelvic organ prolapse repair operations to protect the body from new hernias in the same location.

1.1 Materials Used

CEMENT (IS: 12269-1987)

Ordinary Portland cement is by far the most important type of cement. The OPC was classified into three Grades viz., 33 Grade, 43 Grade and 53 Grade depending upon the strength of the cement at 28 days when tested as per IS 4031-1988. If the 28 days strength is not less than 33 N/mm2, it is called 33 Grade cement, if the strength is not less than 43 N/mm2, it is called 43 Grade cement, and if the strength is not less than 53 N/mm2, it is called 53 Grade cement.

AGGREGATE

Aggregate properties greatly influence the behavior of concrete, since they occupy about 80% of the total volume of concrete. The aggregate are classified as

(1) Fine aggregate

The sand should be free from clay and inorganic material. For this study locally available river sand used as a fine aggregate which belongs to zone-II. For increased workability and for economy as reflected by use of less cement, the fine aggregate should have a round shape. The purpose of fine aggregate is to fill the voids in the coarse aggregate and to act as a workability agent.

(2) Coarse aggregate

The coarse aggregate are granular materials obtained from rocks and crushed stones. Coarse aggregate form the main matrix of the concrete,

in case of coarse aggregate maximum 20 mm coarse aggregate is suitable for concrete work. But where there is no restriction 40 mm or large size may be permitted. Crushed granite aggregate conforming to IS: 383-1970 was used for the preparation of concrete. Coarse aggregate of size 20mm, having the specific gravity of 2.74.

Recron 3s Fiber

Recron 3s may be a state of art reinforcing material which is employed to extend the strength during a sort of applications like automotive battery, paper, filtration fabrics, and asbestos cement sheets, cement based pre-cast products and for improving quality of construction. A product of in depth R&D in Reliance industry limited (RIL) state-of-the-art Technology center.

Fiber parameters which govern the crack control and failure inhibition action include:

- High Fiber Area
- High Bond Strength
- Balanced Fiber Pull-Out & Rupture Strengths
- High Fiber Aspect Ratio (L/D) Fibers not only retards crack initiation but also reduces the crack width expansion caused by long term thermal gradient exposures & induced stress due to dynamic & static loading on the structure. It has been found that in view of the bridging mechanism induced by presence of Recron 3S fiber the crack width widening & subsequently permeability of the structure is retarded drastically.

Recron 3s Fibre

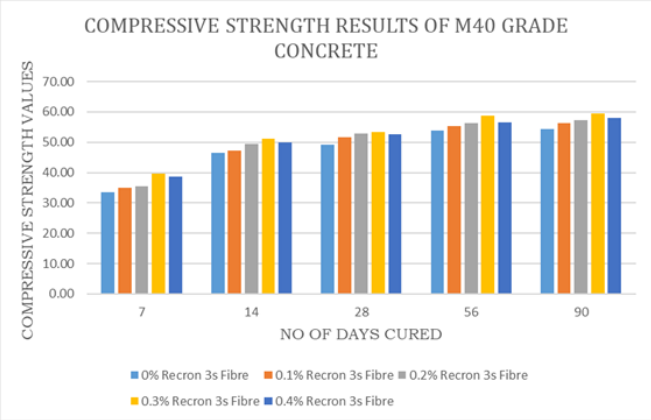
1.2 Preparation and testing of specimen

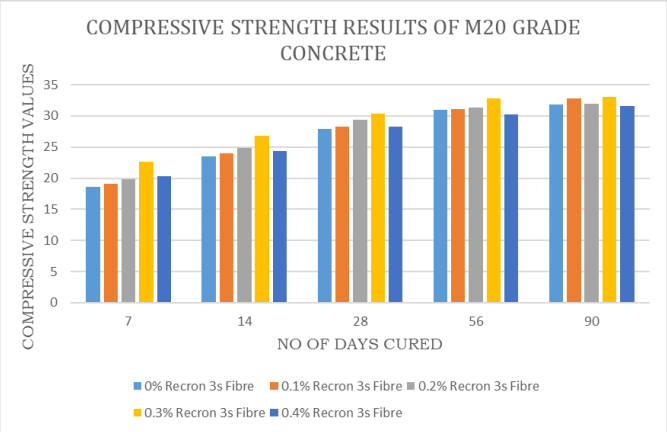
M40 grade concrete was used to find out the test results. For that concrete specimens were prepared to find out the compressive strength, split tensile and flexural strengths. Concrete cubes of size 150 X 150 X 150mm were casted for all grades of concrete, 150 X 300mm cylinders were used for split tensile strength values and 150 X 150 X 600mm beams were used to find out flexural strength values. The above specimens were cured and tested at 7, 14, 28, 56 and 90 days curing were taken into consideration, apart from that M20 grade concrete also prepared and the results of both these were compared and tabulated below.

2. Results and Discussions

2.1 Compressive strength test

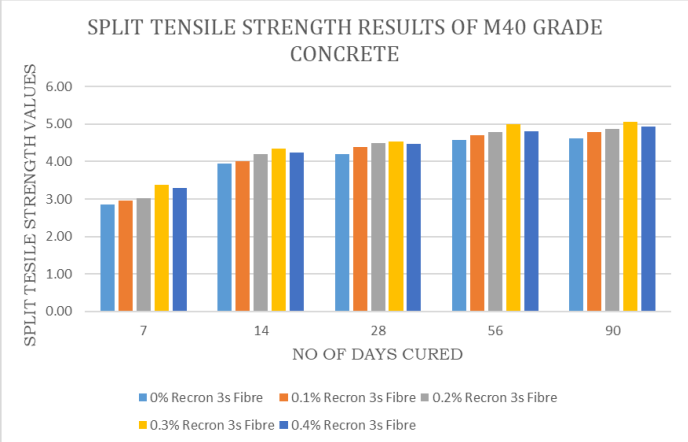
The compressive strength results of both M40 & M20 grade concrete were carried out at 7, 14, 28, 56 and 90 days under curing under normal water

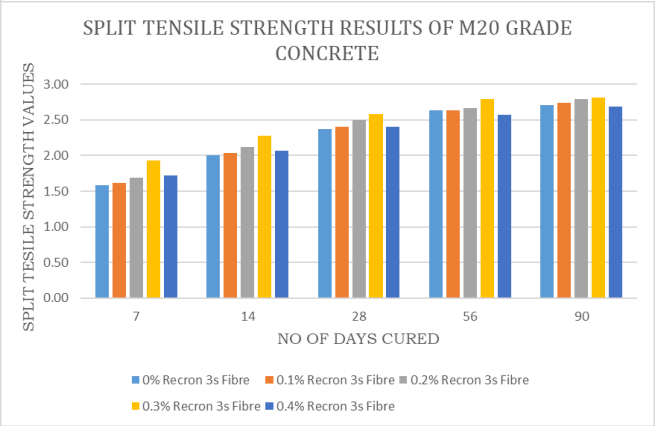




2.2 Split tensile strength test

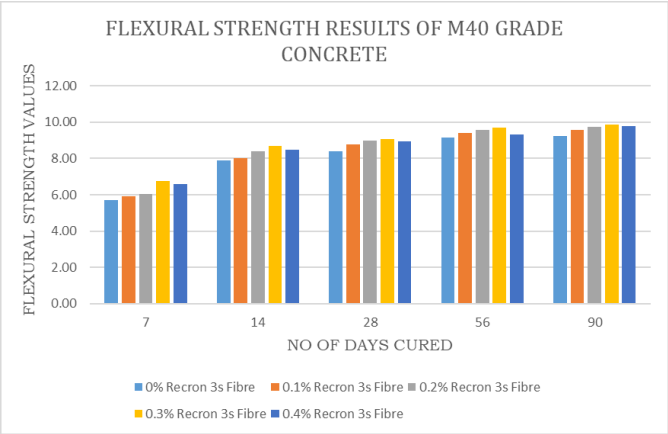
The split tensile strength results of M40 & M20 grade concrete were carried out at 7, 14, 28, 56 and 90 days under curing under normal water

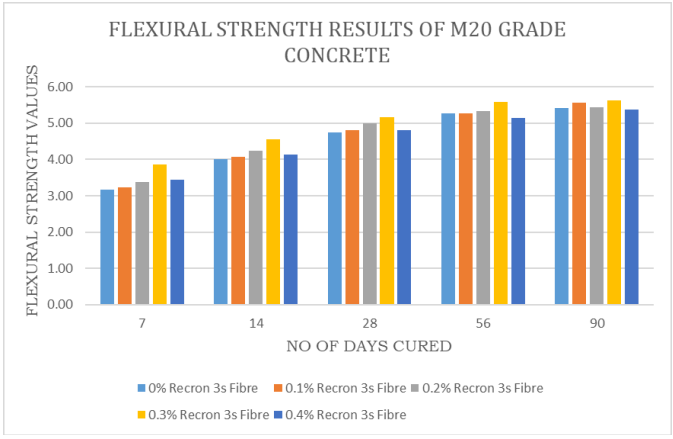




2.3 Flexural strength test

The Flexural strength results on M40 & M20 grade concrete were carried out at 7, 14, 28, 56 & 90 days under curing under normal water.





From the above test results it shows that upto 0.3% addition is suitable for the compressive strength, Split tensile Strength and Flexural strength the strength increases and from there onwards it decreases. Hence the optimum percentage of replacement is marked at 0.3% addition of cement.

3. CONCLUSIONS

1. The compressive strength of concrete is increased with respect to target mean strength and conventional compressive strength at 7 and 28 days curing, when Recron 3s fiber is added up to 0.3% with cement.
2. On addition of Recron 3s FIBRE with cement, the compressive strength and split tensile strength decrease with over increase in Recron 3s FIBRE content.
3. The strength of the concrete at 0.3% addition of concrete gives the maximum results after the strength decreases.
4. By comparing both the grades of concrete the behavior of Recron 3s fiber in concrete is same at all days of curing.
5. It Reduces Water Percolation & Concrete Permeability
6. It increases toughness of hardened concrete
7. Recron 3s fibers improve the long term durability of concrete
8. By using Recron 3s fiber it can control cracks in concrete.

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