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"A Case Study on Fibre Reinforced Concrete"

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Abstract: ***The concept of using fibers in concrete to improve resistance to cracking and fragmentation is old and intuitive. During the last 30 years different types of fibers and fiber materials were introduced and are being continuously introduced in the market as new applications. In this thesis, commercially available synthetic fibers namely, polypropylene, is used to study the effects of polypropylene fiber used for reinforcing concrete mixes and to obtain basic strength. The compressive, splitting tensile strength tests were performed by changing fiber weight content from 0% to 1% of the cement weight content. As a result, it was found that the use of polypropylene fiber considerably increases the tensile strength as the fiber content is increased. The compressive strength has increasing by 10% with (0.25%) of fiber than start decrease with increase the fiber quantities. Compared to corresponding plain concrete, there was a favorable decrease in drying shrinkage and creep of specimens containing various fiber contents.***

Keywords: Fragmentation, Cracking, Commercially, Synthetic, favourable.

I. INTRODUCTION

Concrete is one of the most versatile building materials. It can be cast to fit any structural shape. It is readily available in urban areas at relatively low cost. Concrete is strong under compression yet weak under tension and a relatively brittle material. As such, a form of reinforcement is needed. The most common type of concrete reinforcement is via steel bars. The advantages to using concrete include high compressive strength, good fire resistance, high water resistance, low maintenance, and long service life. The disadvantages to using concrete include poor tensile strength, and formwork requirement. Tensile strength of concrete is typically 8% to 15% of its compressive strength. This weakness has been dealt with over many decades by using a system of reinforcing bars (rebars) to create reinforced concrete; so that concrete primarily resists compressive stresses and steel bars resist tensile and shear stresses.

II. OBJECTIVE OF THIS STUDY

The objectives of this thesis are as follows:

A. The philosophical objective of the thesis is to contribute to the knowledge of the properties of fiber reinforced concrete (FRC), helping to extend the use of the material to structural design.
B. Study of the effect of using polypropylene fiber on concrete compressive and split tensile strength.
C. Assessment of the effect of polypropylene fiber reinforcement in minimizing plastic and drying shrinkage cracks of the concrete.
D. Improve the overall durability and long-term performance of concrete structures.
E. Develop joints between columns and beams by use steel fiber reinforced concrete (especially in joint seismic performance).

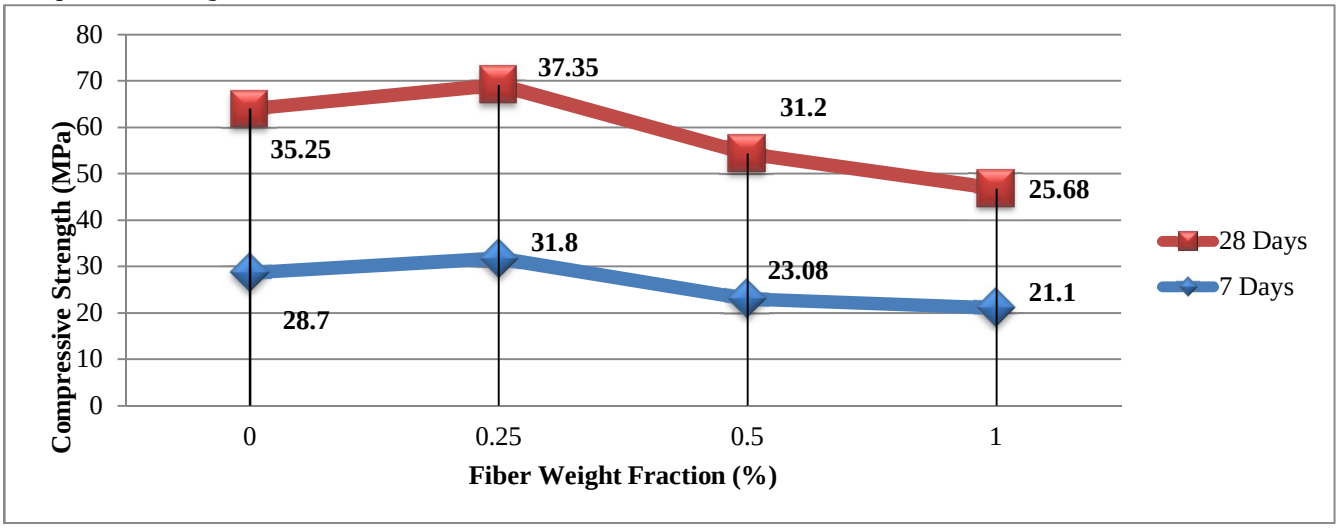
III. LITERATURE REVIEW

1) *Dr. L. B. Zala, et al (2012)* The authors reported that Compressive strength reduces when replacement of hypo sludge percentage increases when compare to traditional concrete. Replacement of cement with hypo sludge provides maximum compressive strength at 10% replacement but it is lesser than traditional concrete. Flexural strength of beam reduces when replacement of hypo sludge percentage increases when compare to traditional concrete.
2) *Dharani.N et al. (2013)* The authors found that The optimal replacement percentage of cement with hyposludge is found to be 30% when Recron 3s fibers are not added. On addition of Recron 3s fiber with cement matrix, the compressive strength and split tensile strength decrease with increase in fiber content, however the flexural strength increases with increase in fiber content.

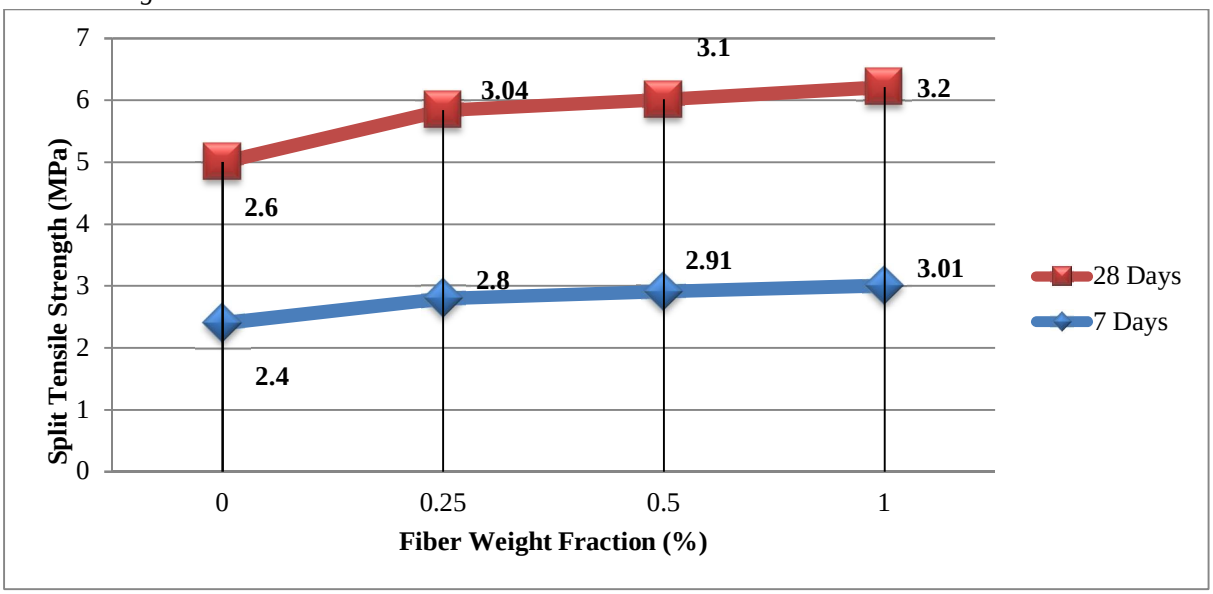
3) *Mr. R. Balamurugan, et.al (2014)* The authors further increase in hypo sludge reduces the strengths gradually. If silica is added the strength will be considerably increased, because of lack of silica in hypo sludge, considerably this type of Concrete, will be used for road works effectively with less consumption of cement.
4) *Dharani .N (2015)* The authors indicated that 10% replacement of cement with Hypo sludge and 50% replacement of fine aggregate with Copper slag show increase in compressive strength and flexural strength compared to other combinations. 10% replacement of cement with Hypo sludge and 40% replacement of fine aggregate with Copper slag show increase in split tensile strength compared to conventional mix.
5) *Nilesh K. Vasoya., et al (2015)* The authors noticed that The industrial waste materials were found to be performing better than normal concrete, in properties such as workability, durability, permeability and compressive strength. Utilization of these wastes in concrete will not only provide economy but also help in reducing disposal problems.
6) *S. C. Patodi, C. V. Kulkarni (2012)* The authors found that matrix having 0.3% of recron and 0.7% of steel fiber volume fraction was found: More balanced in terms of strength and post – peak ductility. Best resistance against impact and maximum toughness. For overall better performance.

IV. RESULTS

A. *Compressive Strength Test*



B. *Split Tensile Strength Test*



V. CONCLUSION

In the light of the preceding results and discussion, the following can be concluded:-

A. The addition of polypropylene fibers effect on the compressive strength has increasing by 10% with (0.25%) of fiber than start decreases by with increase the fiber quantities.
B. High quantities of fiber produced concrete with poor workability and segregation, higher entrapped air and lower unit weight.
C. A significant effect on the mode and mechanism of failure of concrete cylinders in a comp. testing with (FRC).The fiber concrete fails in a more ductile mode.
D. The (PC) cylinders typically shatter due to an inability to absorb the energy by the test machine at failure.

E. Fiber concrete cylinders continue to sustain load and large deformations without shattering into pieces.
F. The addition of polypropylene fibers effect on the split tensile strength has increasing by 17%, 18% and 20% with 0.25%, 0.5% and 1.0% of fiber respectively.
G. That improve the tensile and cohesion of concrete.
H. The fiber concrete fails in more ductile mode opposite the plain concrete that shattering into pieces.

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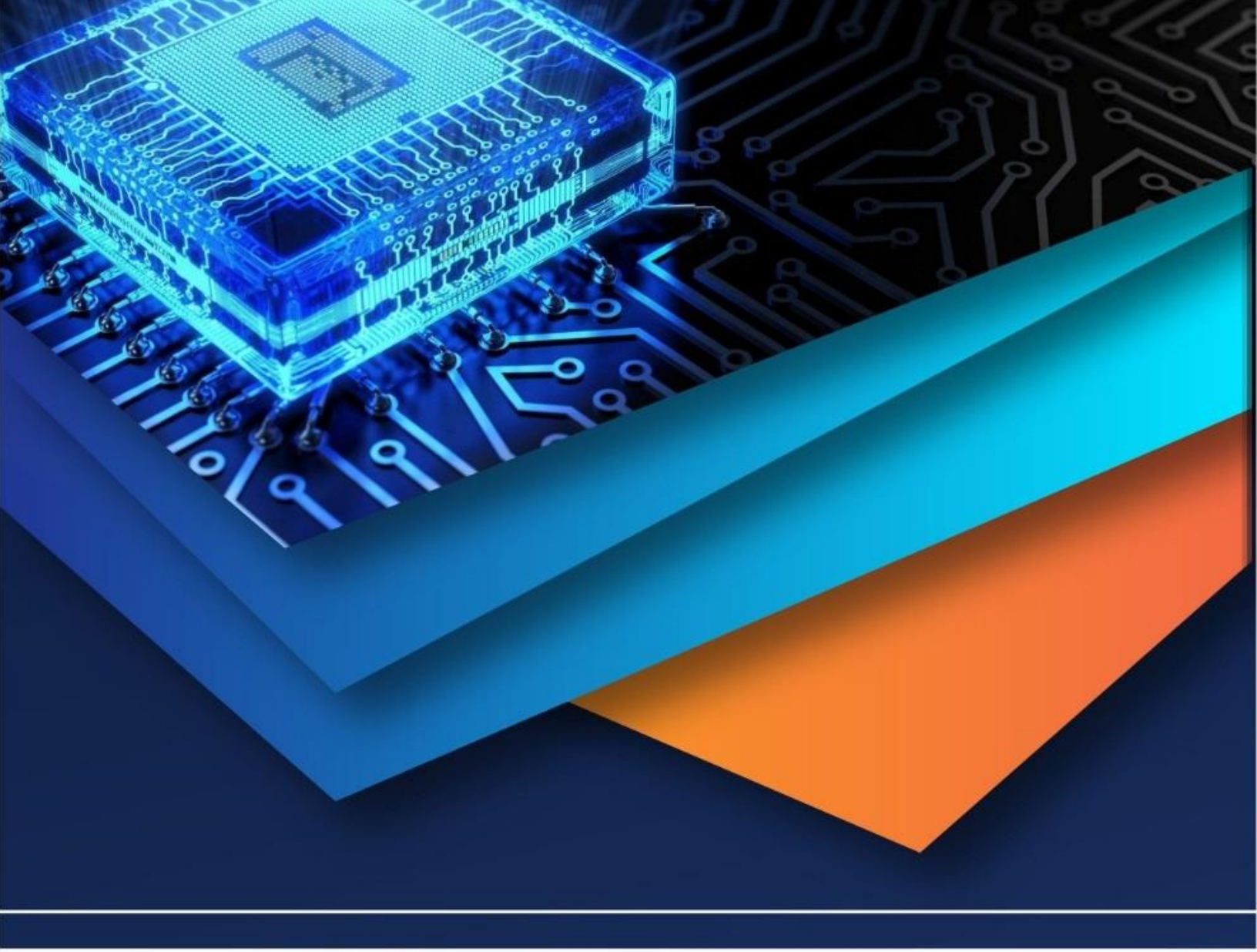

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