A Study on Mechanical Properties of Recron Fibre Reinforced Concrete by Partial Replacement of Cement with Egg Shell Powder

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Abstract—**The main objective of this experimental study is to investigate the strength performance of Recron fibre reinforced concrete of M30 grade produced by replacing cement with Egg Shell Powder in various percentages like 5%, 10%, 15% and 20% both in OPC & PSC and also addition of Recron fibres in different percentages like 0.2%, 0.3%, 0.4% and 0.5%. The Optimum percentage of ESP in OPC & PSC can be determined and it can be used for determining Compressive and Split Tensile strength tests by adding different percentages of Recron fibers. The strength characteristics of Conventional OPC & Recron fiber reinforced concrete and the Conventional PSC & Recron fiber reinforced concrete are compared. And also the strength characteristics of Recron Fibre reinforced concrete of OPC are compared with Recron Fibre reinforced concrete of PSC at the age of 7 to 60 days. In this study, Cube and Cylinder specimens are prepared for Compressive and Split Tensile strength tests and they were tested at the age of 7, 28 and 60 days.**

Keywords— **OPC 53 Grade Cement, Portland Slag Cement, Recron Fiber, Compressive Strength, Split Tensile Strength.**

I. INTRODUCTION

1.1 General Introduction

Concrete is a homogeneous mix of cement, aggregates and water. Concrete is used for various construction purposes such as in buildings and their components, roads, water retaining structures, air fields, docks and harbours because of its exceptional qualities. It has numerous other advantages over other construction materials. The production of cement is an energy intensive process, resulting in emission of green house gases which adversely impact on the environment.

1.2 Scope of the Work

The main objective of this experimental study is to investigate the strength performance of fibre reinforced concrete produced by replacing cement with ESP as a cementitious material in various percentages like 5%, 10%, 15% and 20% both in OPC & PSC and addition of Recron 3S fibres with different percentages like 0.2%, 0.3%, 0.4% and 0.5%. The Optimum percentage of ESP is found out in OPC & PSC and to that the Recron fibres of different percentages are added. In this study, Cube and Cylinder specimens are prepared for Compressive and Split Tensile strength tests. Three samples for each set of percentage have been taken for conducting test and average of results are taken. The samples were tested at the age of 7, 28 and 60 days.

II. LITERATURE REVIEW

S.Uttamraj & Dr.Rafeeq (2017) conducted an experimental study on M- Sand and Recron 3s Fiber for M30 Concrete in two phases in first phase to find the effect of fresh properties of concrete like workability and hardened properties like compressive strength , split tensile & flexure strength of the concrete by replacing natural sand by robo sand in proportions of 0% and 50% & 100%with cubes 18cubes of 150mmx150mmx150mm, 18 cylinders of and at different percentages of 0%, 0.5%, 1%, 1.5% & 2% and cubes 27cubes of 150mmx150mmx150mm, 27 cylinders of 150mmx300mm, 27prisms of 150mmx150mmx700mm were casted and tested at the age of 7 days and 28 days.

Anusha Chowdary, Chaithra. N, Dr. Chethan. K (2017) has conducted a Study on Impact of Polypropylene (Recron 3S) Fibers on Compressive and Tensile Strength of Concrete. The experimental study of this investigation consists of design of M40 grade concrete mix. The mix was worked out giving certain proportions by keeping the obtained water- cement ratio constant as 0.40. Concrete blends, viz. conventional concrete blends with differing rates of fly ash (0, 20, 30 and 40%) as cement replacement material were examined. Simultaneously the fibers were varied from 0 - 1% for each of the fly ash replacement in the concrete mix.

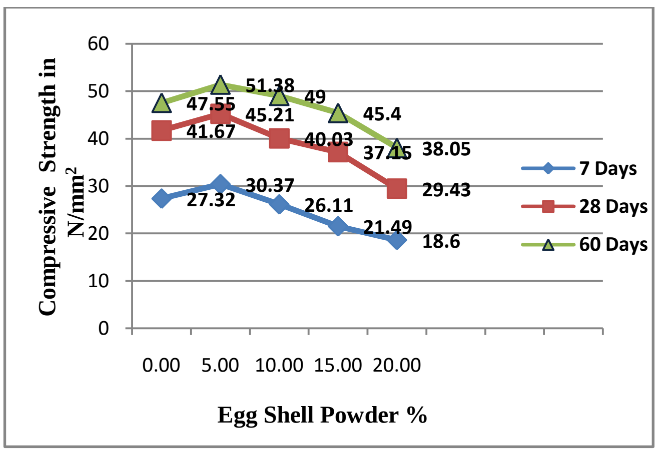
Monisha T, Dr. T. Bhagavathi Pushpa (2016), has studied Experimental Investigation on Concrete using Eggshell Powder and Polypropylene Fibre. They use egg shell powder 20% constantly as replacement of fine aggregate and polypropylene fibre in the range of 0%, 0.2%, and 0.4% in theM20 concrete by the volume of fraction. Various tests such as compressive strength, split tensile strength and flexural strength were carried out. The strength properties obtained were compared with the conventional concrete after the curing period of 7, 14 and 28 days. From the results it was observed that, the waste of egg shell powder used in the concrete will be comparatively low cost when compared with normal concrete. Concrete acquires maximum increase in compressive strength at 20% of fine aggregate replaced by ESP & 0.2% of PP fibre was added by the weight of concrete for M20 grade of concrete.

III. MATERIALS

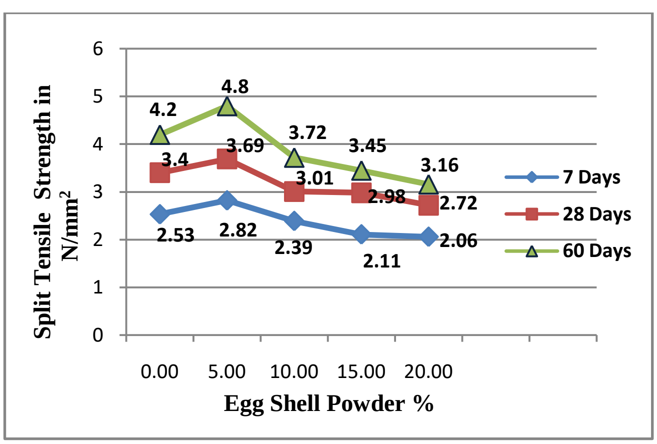
The materials used in this investigation are Ordinary Portland Cement of 53 Grade, Portland Slag Cement, Sand, Coarse aggregate, Egg shell powder, Recron Fibre and Water.

Figure: Recron 3s Fiber

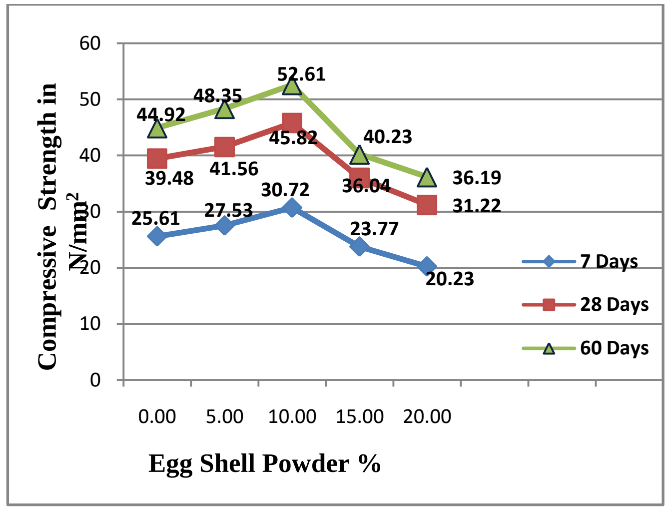
IV. RESULTS



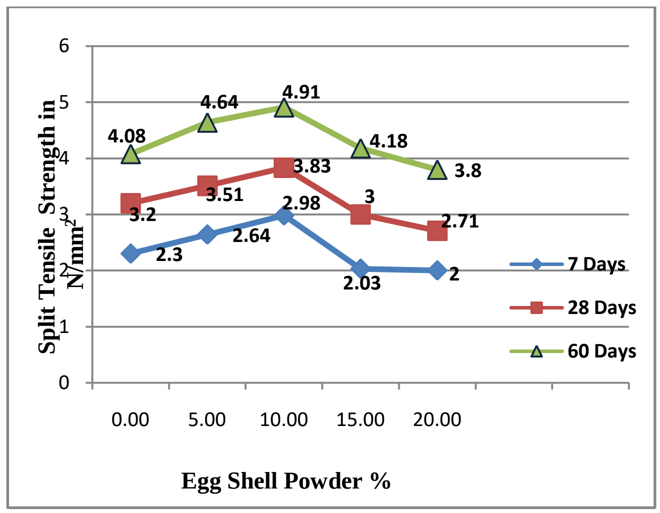
Graph: 6.1. Compressive Strength of M30 Grade Concrete of OPC with varying percentages of ESP



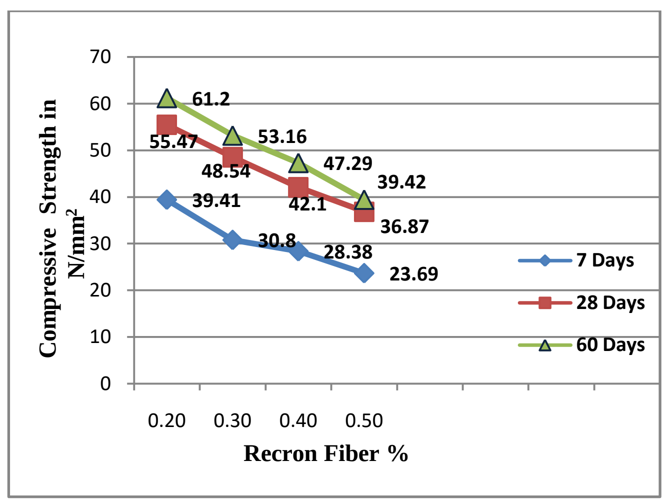
Graph: 6.2. Split Tensile Strength of M30 Grade Concrete of OPC with varying percentages of ESP



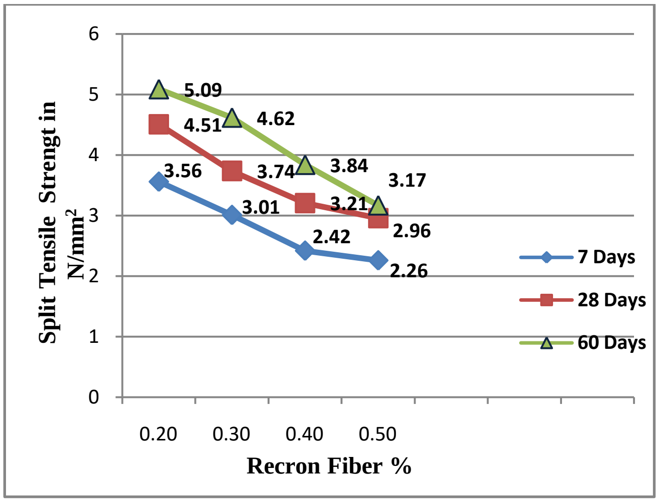
Graph: 6.3. Compressive Strength of M30 Grade Concrete of PSC with varying percentages of ESP



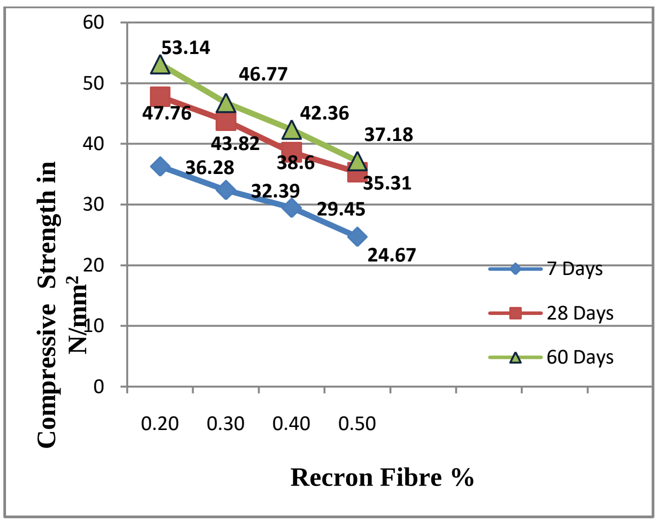
Graph: 6.4. Split Tensile Strength of M30 Grade Concrete of PSC with varying percentages of ESP



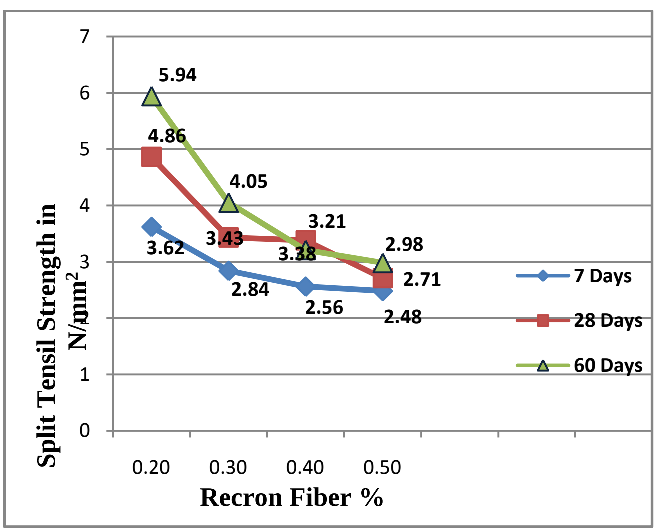
Graph: 6.5. Compressive Strength of M30 Grade Concrete of OPC with 5% ESP replacement and addition of different percentages of Recron Fibre.



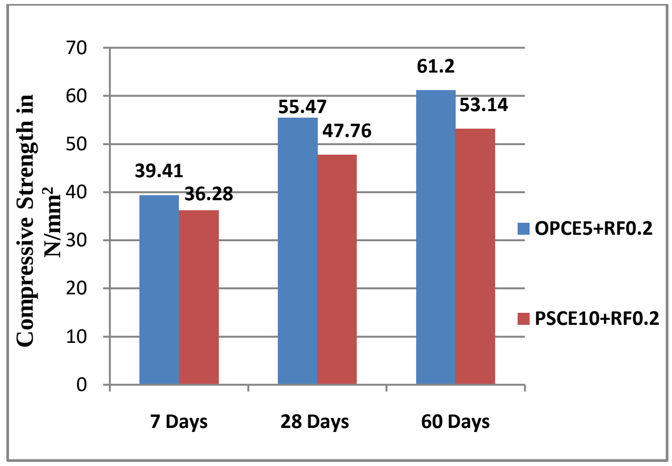
Graph: 6.6. Split Tensile Strength of M30 Grade Concrete of OPC with 5% ESP replacement and addition of different percentages of Recron Fibre



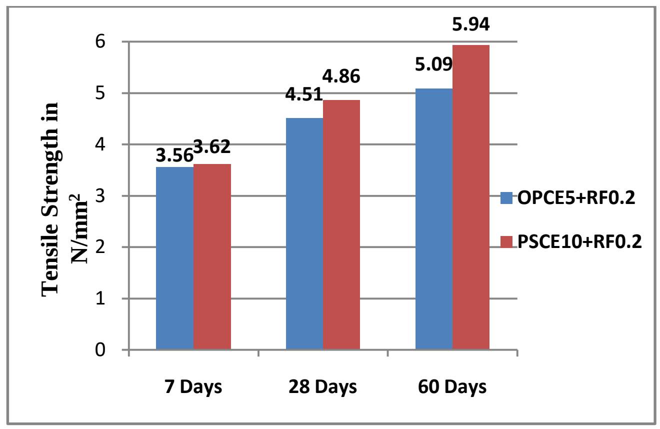
Graph: 6.7. Compressive Strength of M30 Grade Concrete of PSC with 10% ESP replacement and addition of different percentages of Recron Fibre



Graph: 6.8. Split Tensile Strength of M30 Grade Concrete of PSC with 10% ESP replacement and addition of different percentages of Recron Fibre



Graph: 6.9. Compressive Strength of M30 Grade Concrete of OPC with 5% ESP & PSC with 10% ESP replacement and addition of 0.2% Recron Fibre



Graph: 6.10. Split Tensile Strength of M30 Grade Concrete of OPC with 5% ESP & PSC with 10% ESP replacement and addition of 0.2% Recron Fibre

V. CONCLUSION

1. This experimental study shows that the combination of ESP and Recron 3S Fibres improves the properties of concrete by achieving good strength results than the normal cement concrete.
2. Egg Shell Powder has been added in percentages of 5%, 10%, 15%, 20% and the Optimum percentage of Egg Shell Powder replacement for Compressive and Tensile strengths are obtained at 5% for OPC and 10% for PSC and on further increment of ESP the strength reduces.
3. By Keeping the Optimum percentage obtained at 5% for OPC and 10% for PSC, the Recron fibres of different percentages like 0.2%, 0.3%, 0.4% and 0.5% are added and then the maximum Compressive strength and Split tensile strength of Recron fibre reinforced concrete occurs at 0.2 percent in both OPC and PSC at 7, 28 and 60 days.
4. Addition of Recron fibres in Conventional Concrete of Ordinary Portland Cement (OPC) the compressive strengths and split tensile strengths increases.

5. Addition of Recron fibres in Conventional Concrete of Portland Slag Cement (PSC) the compressive strengths and split tensile strengths decreases.
6. The Percentage increase in Compressive strengths of Recron fibre reinforced concrete for Ordinary Portland Cement (OPC) with conventional concrete are 44.25, 33.12 & 28.70% for 7, 28 and 60 days at 0.2% Recron fibre. It is observed that the Compressive strength of OPC shows better results than PSC.
7. The Percentage of increase in Split Tensile Strengths of Recron fibre reinforced concrete for Portland Slag Cement (PSC) with conventional concrete are 57.4, 51.87 & 45.59% for 7, 28 and 60 days at 0.2% Recron fibre. It is observed that the Split Tensile Strength of PSC shows better results than OPC.
8. Increase in percentages of Recron fibres results in less Compressive Strength and Split Tensile Strength values.

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