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EXPERIMENTAL STUDY ON REINFORCED CONCRETE WITH PLASTIC FINE AGGREGATES

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ABSTRACT

Plastic fiber reinforced concrete using plastic fine aggregates is to improving the concrete strength by waste product of plastic mixing without affection of strength by plastic fine aggregates. The addition of plastic aggregates indicates that at varying percentages of proportion gives different compressive results. At 5% and 10% replacement of fine aggregate in M25 concrete cubes the increase in strength up to 19.24% than the conventional mix. The addition of plastic aggregates indicates that at varying percentages of proportion gives different split tensile results.

Key Words –Plastic Reinforced Concrete, Split Tensile Strength, Flexural Strength, Plastic Aggregate.

1.1 Introduction

Plastics are normally stable and not biodegradable. So, their disposal is a problem. Research were on to use plastic waste effectively as additives in plain and reinforced concrete mixes for variety of purposes. This study attempts to give a contribution to the effective use of plastic wastes in concrete in order to prevent the environmental strains caused by them. Different sizes of plastic wastes were collected and used in replacement of aggregates in concrete. These type of usages normally generates more amount of wastes which are to be disposed off properly. Environmentally sensitive aware people condemn the use of plastics for amount of pollution caused by them in disposal. However, this is not a serious problem in comparison to the waste and pollution generated by a host of other industries. There has been a steep rise in the production of plastics from a mere 30 million kN in 1955, it has touched 1000 million kN at present. It is estimated that on an average 25% of the total plastic production in the world is used by the construction industry

1.2 Types of plastic

- Low Density Polyethylene (LDPE)
- High Density Polyethylene (HDPE)
- Poly propylene (PP)
- Poly methyl pentene (PMP)

2 PLASTIC AGGREGATE

The plastic wastes were collected from the available plastic waste mart. These plastic wastes were collected in granular shapes. These collected materials were sieved in 4.75mm and the materials passing the sieve were taken for the replacement of FA at different proportions.

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Table 1 Tests on Waste Plastic Samples

SI. No	Tests	Result
1	Specific gravity	1.14

3. CONCRETE MIX DESIGN

Concrete has to be of satisfactory quality in both the fresh and hardened states. The task of proportioning concrete mixes is accomplished by the use of certain established relationships which afford reasonably accurate guidance for selecting the best combination of ingredients so as to achieve the desirable properties of the fresh and hardened concrete.

3.1 Mix Proportions

The concrete mix is designed as per the guidelines given in the various Indian Standards namely IS 10262-2009, IS 456-2000 and SP 23. The water cement ratio was maintained at 0.45. The mix proportions for M25 grade 1: 1.3: 2.08

Table 2 Requirement of material quantity as per the mix designs of concrete

Grade	Vol. of Concrete	Cement (OPC- 53 G)	Water	Fine aggregate	Coarse aggregate	Design Mix Ratio
M25	$1m^3$	426 kg	191.5 litres	559 kg	887 kg	1:1.3:2.08

Table 3 Compressive Strength Results on PA of M25 Grade

% Of Replacement	7 Day Compressive Strength(Mpa)	28 Day Compressive Strength(Mpa)
0%	21.85	29.1
5%	23.45	34.7
10%	25.15	35.45
15%	25.55	28.05
20%	23.05	25.95
25%	20.65	25.4

4 TESTS ON HARDENED CONCRETE

4.1 Compression Strength

The test conducted on the compressive strength specimen, it is observed that by the addition of 10% plastic aggregates in the M25 concrete cubes, increase in compressive strength of 19.24% than the conventional mix is found.

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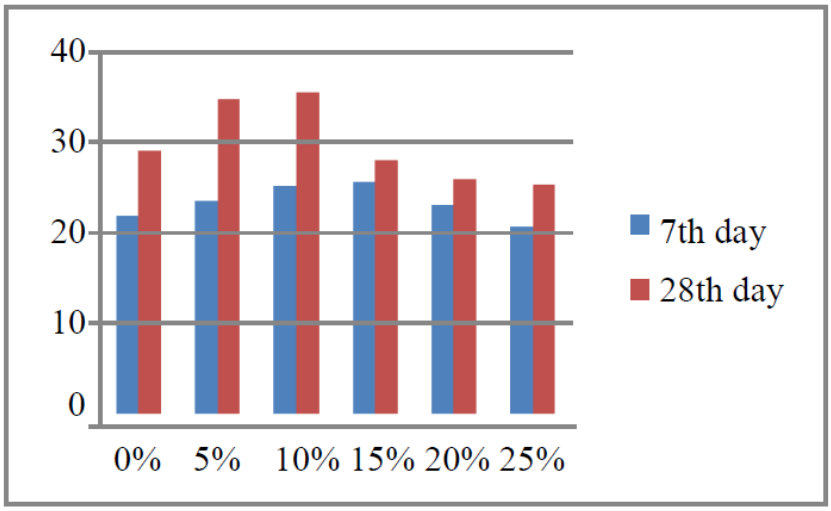

Fig. 2 Compressive Strength of PA for M25 Grade

4.2 Split Tensile Strength (STS)

The casting of cylinders of varying proportions was made using the available mix design of M25 grade of concrete. Each test carries 9 different cylinders of single proportion for 3 times of testing. The cylinder dimension is 150mm x 300mm.

The split tensile property of the M25 cylinders of plastic aggregate mixed concrete gets reduced from the conventional mix. The range of reduction at different replacements is between 9.6% - 25.4% than to the conventional mix. The split tensile strength results of different specimen of M25 grade.

Table 4 Split Tensile Strength Results On PA of M25 Grade

% Of Replacement	7 Day Split Tensile Strength N/mm^2	28 Day Split Tensile Strength N/mm^2
0%	3.21	3.42
5%	2.33	3.12
10%	2.13	3.27
15%	2.05	3.06
20%	1.89	2.55
25%	1.56	2.55

Fig .3 Split Tensile Strength with PA

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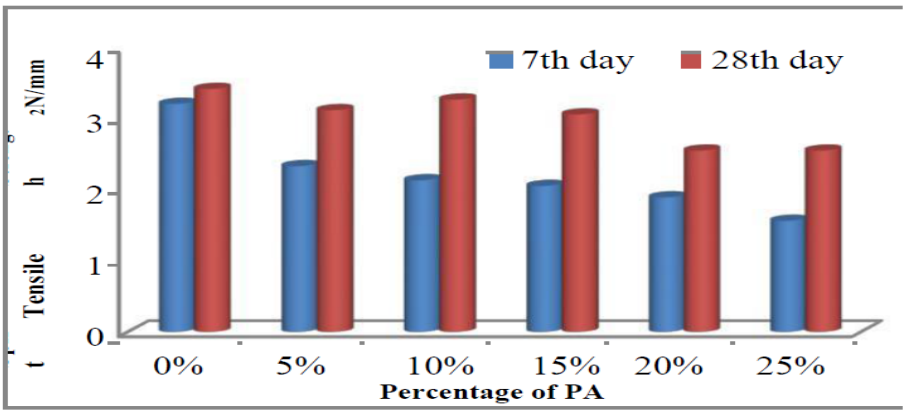

Fig. 4 Split Tensile Strength On PA for M25 Grade

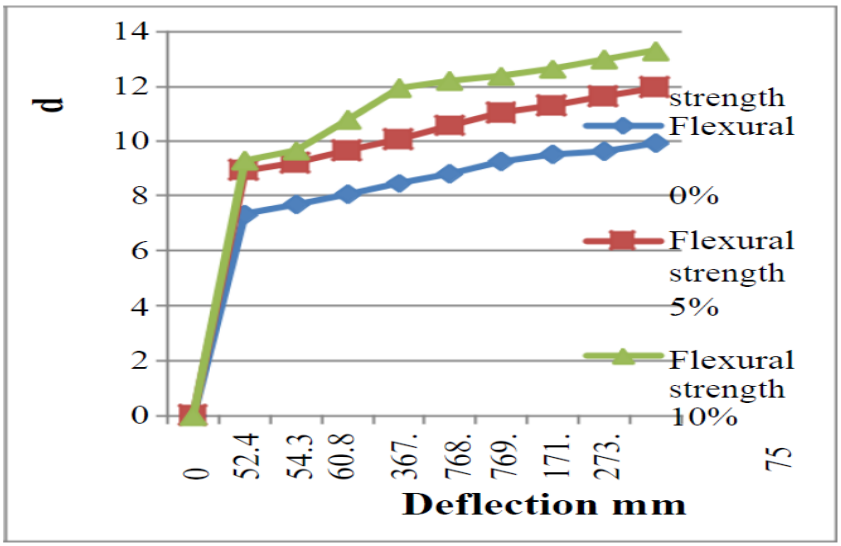

Fig .5 Combined Graph On Load And Flexural Strength

4.3 Flexural Strength of PA Concrete

The prisms were casted with the dimension of 50 X 50 X 300 mm. They were tested in a loading frame and three-point loading was done in the prism specimen. The load and the deflection were noted for the 0%, 5% and 10% replacement of plastic aggregate. The graph is plotted. It is observed that the 10% replacement of PA with fine aggregate shows good resistance in flexure, which is shown in the fig 5.

5.0 Conclusions

The addition of plastic aggregates indicates that at varying percentages of proportion gives different compressive results. At 5% and 10% replacement of fine aggregate in M25 concrete cubes the increase in strength up to 19.24% than the conventional mix.

The addition of plastic aggregates indicates that at varying percentages of proportion gives different split tensile results. At different percentages replacement of M25 concrete cylinders the decrease in

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strength ranges up to (9.6% - 25.4%) than the conventional mix.

The addition of plastic aggregates indicates that at varying percentages of proportion gives different flexural test results. At different percentages replacement of M25 concrete RC beams the increasing strength ranges up to (0%, 5%,10%) than the conventional mix.

REFERENCES

[1] A.A.Al-manaseerandT.R.Dalal.(1997),'Concrete Containing Plastic Aggregates',International Concrete Research & Information Portal, Vol.19, pp. 47-52.

[2] A.Bhogayata,K.D.Shah,B.A.Vyas and Dr.N.K.Arora. (2012), 'Performance of concrete by using non-recyclable plastic wastes as concrete constituent', International journal of engg research and technology, vol.4, pp. 1-3.

[3] Ankur Bhogayata and N.K. Arora. (2008), 'Use of post- consumer plastic wastes in concrete',International scholarly research network, ISRN civil engineering, vol.2.

[4] Baboo rai, S.Tabin Rushad, Bhavesh Kr and S.K.Duggal. (2012), "Study on waste plastic mix concrete with plasticizer", International scholarly research network, ISRN civil engineering, vol.2, pp. 73-79.

[5] Dr.Prahallada M.C and Dr.Prakash K.B. (2006),'Strength and workability characteristics of waste plastic fiber reinforced concrete produced from recycled aggregates', International journal of engineering research and application, vol.1, pp. 1791-1802.

[6] IS: 10262:2009, "Recommended guidelines for concrete mix design", Bureau of Indian Standards, New Delhi.

[7] IS: 12269:1987, 'Specification for 53 grade Portland cement', Bureau of Indian Standards,New Delhi.