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EFFECT AND OPTIMIZATION OF PLASTIC WASTE FOR ENHANCING MECHANICAL PARAMETERS OF CONCRETE

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Abstract— it is aimed to research the effects of plastic waste on the mechanical and durability parameter of concrete. Plastic was used as a part of the filling materials to obtain polymer concrete in this study. Filling material ratio has been determined as 5–95%, 10–90%, 15–85% and 20–80%, plastic/filling material ratio has been decided to be 0%, 5%, 10% and 15%. 28-Day of axial compressive, flexural and splitting tensile strength values of the test samples will be evaluated.

Keywords— Concrete, Waste plastic, Plastic aggregate, Reuse, Light weight

I. INTRODUCTION

Today entire world is facing problems due to environmental pollution. Plastic is the biggest hazard to nature. Plastic is also very harmful to animals and aquatic life. As we know, we can't destroy plastic completely. So by reusing waste plastic in our daily life we can reduce hazard from plastic to the nature. By looking at the current scenario we are going to use plastic waste in concrete. Plastic waste can be a good alternative to the natural filling material. By using plastic waste we can reduce hazard to the nature. It will be environment friendly concrete.

II. MATERIAL

1) Cement:
Brand Name: Ultra tech super
Grade of cement: 53 Grades (IS12269:1987)
Type of cement: Ordinary Portland cement
2) Fine aggregate
3) Course aggregate
4) Plastic material

- Material should be high density plastic which should be melted and grinded to the required size.
- Material should be grind to the size of 10mm to 20mm.
- Material should not have more rounded edges for proper bonding with other material in concrete.
- Material should be free from any other reactive chemicals

Fig.1 Waste plastic material

III. MIX DESIGN

As per 10262:2009 concrete mix proportioning – guidelines trial mix design with different proportion of ingredients has been designed. Table 3.1 presents the design mix proportion for M25 grade.

Mix	Water	Cement	Fine aggregate	Coarse aggregate
	(lit)	(kg)	(kg)	(kg)
M25	209.46	438	666.27	1140.27
	0.478	1	1.52	2.60

Table 3.1 Concrete mix design

IV. RESULT AND ANALYSIS

1) Slump test:

Slump test is most commonly used method to measure consistency of concrete which can be use either in laboratory or at site of work.

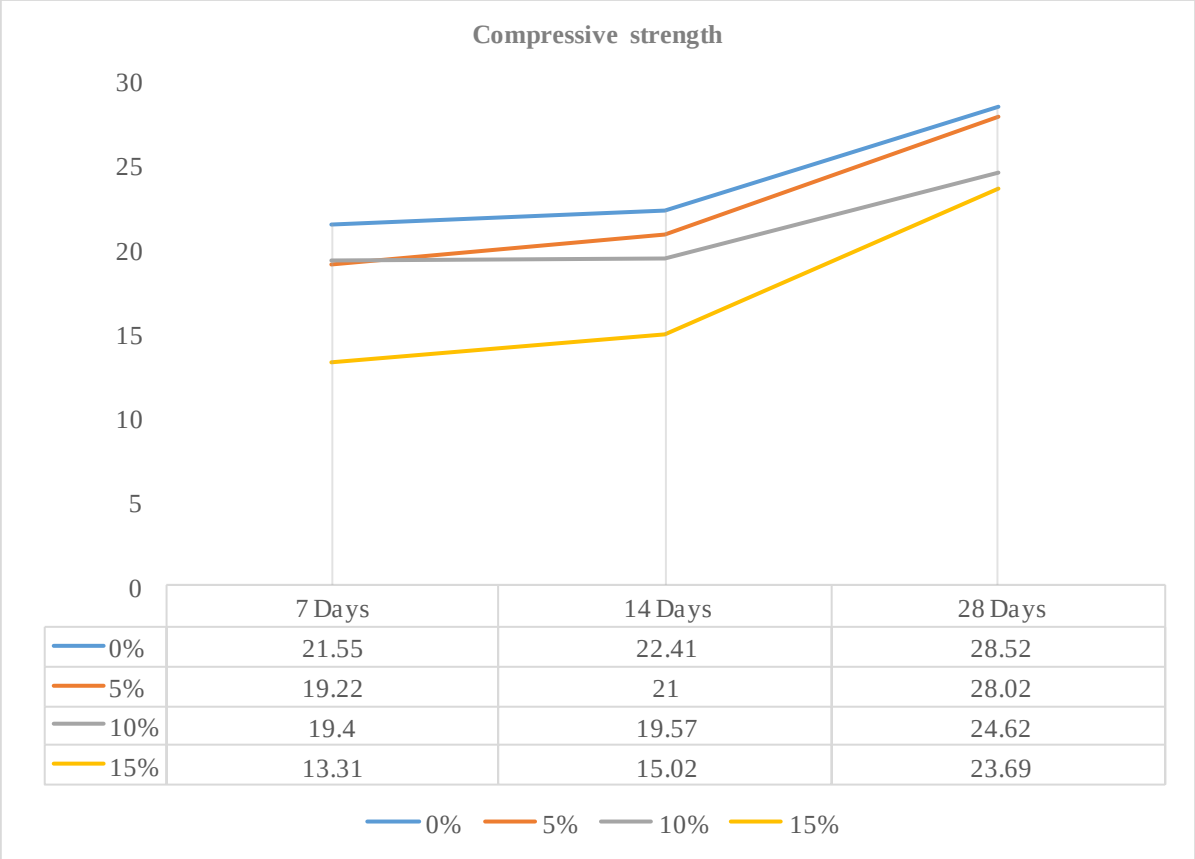
% plastic waste (kg)	Slump()
(kg)	(mm)
0	70
5	75
10	77
15	80

Table 4.1 Slump test

2) Compression test:

The cube specimen is of the size 15cm x 15cm x 15 cm. If the largest nominal size of the aggregate does not exceed 20 mm to 100mm size cubes may also be used as an alternative.

Fig.2 Compression test



	7 Days	14 Days	28 Days
0%	21.55	22.41	28.52
5%	19.22	21	28.02
10%	19.4	19.57	24.62
15%	13.31	15.02	23.69

Fig .3 Compression test results

3) Flexural test:
Concrete as we know is relatively strong in compression and weak in tension force. In reinforced concrete members, little dependence is placed on the tensile strength of concrete since steel reinforcing bars are provided to resist all tensile forces.

Fig. 4 Flexural test

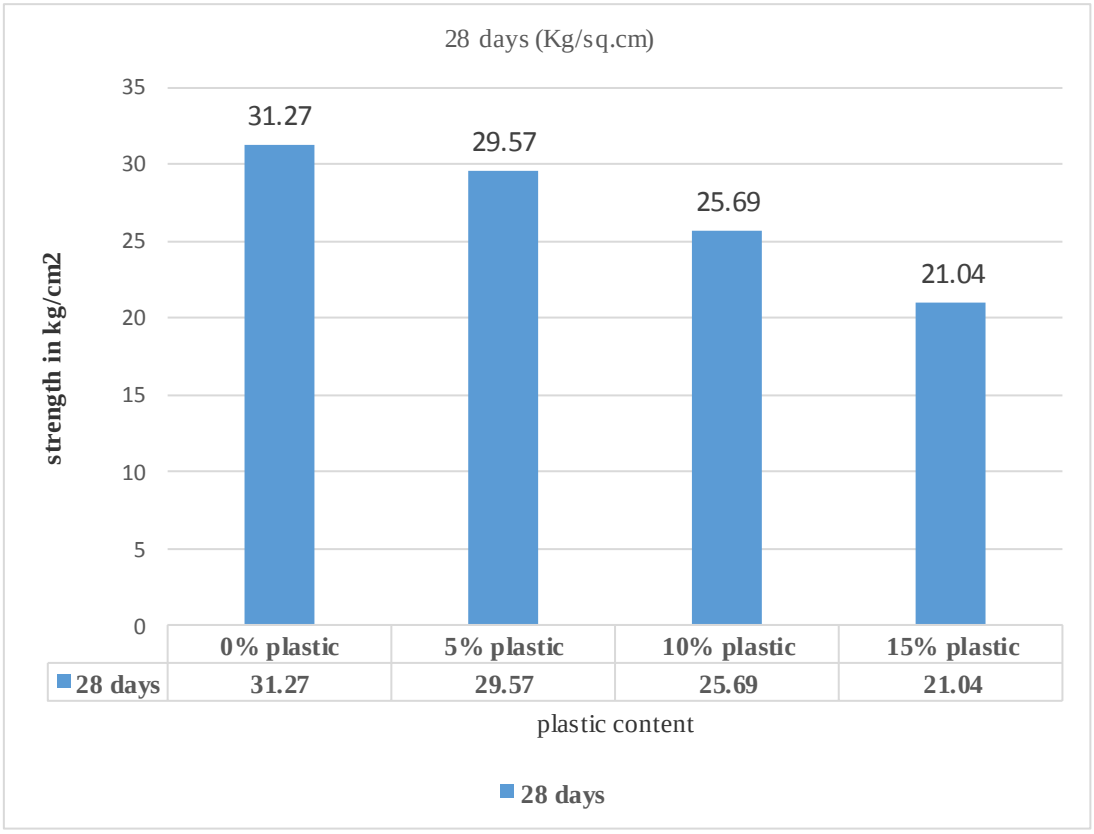


Fig .5 Flexural test results

4) Split tensile test:

Fig. 6 Split tensile test

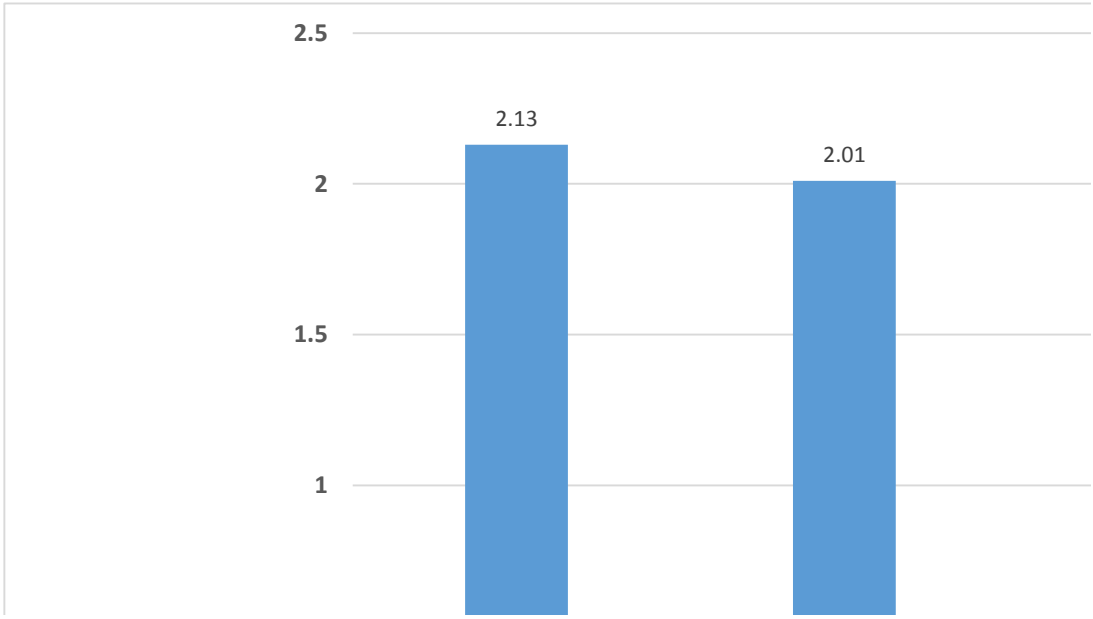


Fig.7 Tensile test results

V. CONCLUSION

- With replacement of natural aggregate with the plastic waste material we can increase in the workability of the fresh concrete.
- It is found that 5% plastic replacement gives the nearest results to the ordinary concrete.
- For 28days flexural test 5% plastic content gives the good results than 10 and 15%.
- 5% plastic content gives good result in split tensile test.

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