

Determining the Strength Properties of Concrete Using Plastic Waste (Synthetic Polymers & Thermoplastic Polymer Resins)



G. Rambabu, P. Mohana Gangaraju, J. Eeshwar Ram

Abstract: The outline of this research paper is the usage of waste plastic materials in concrete mixes. Due to modernization with rapidly growing industries, urbanization all over the world has produces large amount of plastic waste. This produces enormous measure of plastic waste because of convey sacks which are utilized for pressing, conveying vegetables and pet jugs which are utilized for drinking reason, those makes a noteworthy ecological issues in light of the fact that, the plastic material will take billions of years to decay totally. The huge amount of plastic transfer waste may cause land contamination and water body gets defiled. The plastic waste is non degradable which is used in concrete to study the behavior of concrete with various percentages (0.0%, 0.2%, 0.4%, 0.6%, 0.8%, 1.0%) of synthetic polymers (carry bags) and thermoplastic polymer resin (pet bottles). The concrete strengths are Compressive strength & Split tensile strengths of various concrete specimens were tested.

Index Terms: Synthetic polymer, Thermoplastic polymer resins, compressive strength, split tensile strength.

I. INTRODUCTION

In present scenario we are observing vast usage of plastic. We know that these plastic polymers are non-degradable and harmful due to long period of exposure to the natural environment. We are observing that there are different types of waste plastic in our surrounding environment. These polymer waste used in concrete is a valuable thing, instead of throwing plastic away, proper utilization of plastic waste in concrete is a good idea to prevent the environmental hazard. Due to the countries with rapid growing industrialization and urbanization all over the world has produces large amount of plastic waste.

Concrete plays a crucial role in building materials utilizing all over the world. Concrete is one of the most by and large used advancement materials, required a great deal of natural resources and energy. Due to the rapid increase of

industrialization and urbanization all over, the world large amount of concrete mix is required. In this concrete mix are we adding the waste plastic materials like synthetic polymer and thermoplastic polymer resins are used in the concrete mix as an admixture. And identify the behavior of concrete specimens when conducting the Compressive strength and Split Tensile strength when adding the waste plastic in various percentages to the concrete.

II. MATERIAL SPECIFICATIONS

Cement: We are using the 53grade of ordinary portland cement of specific gravity of 3.12 for this experimental investigation.

Fine aggregate: We are using the locally available sand having a specific gravity 2.67, zone-II sand using for this experimental purpose as per IS 383:1970.

Coarse aggregate: Natural granite aggregate passing through 20mm IS(Indian Standard) sieve and retain on 12.5mm IS(Indian Standard) sieve are using and having specific gravity of the coarse aggregate is 2.88 and the water content absorption of 0.8% been used as coarse aggregate material.

Water: Fresh and free from organic substance water was used for mixing process and curing.

Waste plastic: Synthetic polymers (carry bag) and thermoplastic polymer resins (pet bottles) are used as waste plastics.

III. EXPERIMENTAL PROGRAM

The most important property of concrete in the structural application is Compressive strength. For conducting the Compressive strength using IS mould 150X150X150mm and for Split tensile strength using the IS mould of diameter 150mm and height 300mm of a cylindrical mould for M-20 grade of concrete is used, along with the addition of various percentages (0.0%, 0.2%, 0.4%, 0.6%, 0.8%, 1.0%) of plastic waste and identify the strength of the different specimens for 7, 14 and 28 days.

IV. RESULTS AND DISCUSSION

COMPACTION FACTOR TEST

Compaction factor test is for the most part for use in the research facility yet in can likewise in the field. It is more exact and fragile than the slump test and is especially helpful for solid blend proportions of complete low usefulness as are generally utilized when compaction of concrete is utilized by solid vibrator engine.

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This trial test chips away at the fundamental rule of deciding the level of compaction accomplished by a standard measure of work done by permitting to concrete to fall through a steady tallness. The example of concrete is to be set in the upper container up to the overflow. By opening the device entryway the solid falls in to the base container. Again open the second snare entryway and the solid is permitted to fall in to the chamber. This weight of the chamber is otherwise called "weight of in part compacted cement". The solid is topped off precisely up to the top dimension of the chamber. This weight is known as a ".weight of completely compacted cement".

COMPRESSIVE STRENGTH TEST

Compressive strength test is completed on example cubical fit as a fiddle. The 3D square example is of the size 15x15x15cm. It is utilized to decide the compressive quality of the solid examples as formed in solid 3D square. Table demonstrates that as the 28 days of compressive quality and diverse level of plastic included cement. Likewise demonstrates the chart for level of plastic to compressive quality.

RESULTS OF COMPRESSIVE STRENGTH TEST (N/mm ²)						
Percentage s of plastic	0.00%	0.20%	0.40%	0.60%	0.80%	1.00%
7 days	16.45	15.65	16.35	13.28	11.4	9.87
14 days	20.2	18.35	19.92	16.02	13.2	12.45
28 days	25.6	23.5	42.31	20.65	18.96	20.23

Table.1: Compressive strength of cubes

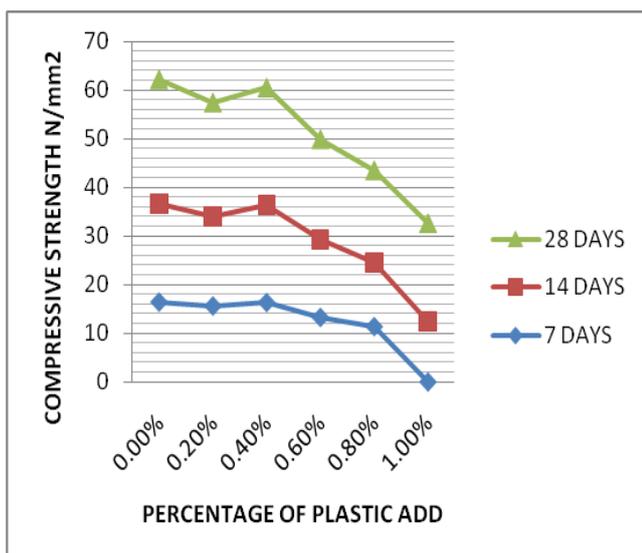


Fig. 1: Compressive strength of cubes for 7, 14, & 28 days

The above table and figure represented the Compressive strength test results for various percentages of plastic waste are added to the concrete and curing for 7, 14 & 28days.

SPLIT TENSILE STRENGTH OF THE CONCRETE

ST quality is one of the essential and most significant properties of concrete. Concrete give better results in compression yet fails in tension and this is one of the disadvantages of cement. Split tensile test were completed on a barrel shaped example 150 mm in diameter and 300 mm tallness. Example will be tried after 7days, 14 days and 28 days separately. Consequence of split tensile test was displayed

Table.2: Split Tensile strength of Cylinders

RESULTS OF SPLIT TENSILE STRENGTH TEST (N/mm ²)						
Percentages of plastic	0.00 %	0.20 %	0.40 %	0.60 %	0.80 %	1.00 %
7 days	1.51	1.79	3.51	2.84	3.11	3.95
14 days	1.83	2	2.92	2.99	1.79	3.21
28 days	4.21	4.33	5.93	5.11	5.56	5.12

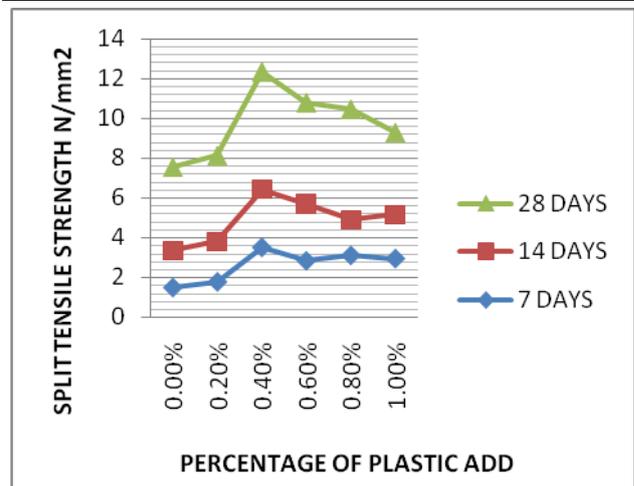


fig.2: Split Tensile strength of Cylinders for 7, 14&28 days

The above figure and table represents the split tensile strength concrete results of various percentages or various ratios of plastic waste added and cured for 7,14&28 days.

V. CONCLUSION

This study investigates the strength properties of concrete with addition of various percentages or various ratios of plastic waste to the concrete in construction works . The changes of strength properties of concrete by addition of waste plastic have been analyzed by using various proportions. The compressive strength is increase when there is no plastic waste and the split tensile strength is increased when adding plastic by 04% after that decreases.

- Since waste plastic Specific gravity is not as much as that of fine total, in this manner self load of cement diminishing, hence it lessens oneself load of the structure/auxiliary segments.

The mixing of plastic waste and concrete using only non important structural elements (i.e low load bearing elements)

FUTURE SCOPE OF STUDY

- The studies can be additionally reached out by option of admixtures with different proportions or different rates to make the solid not to adjust its quality extensively even with the option of more level of plastic waste.
- Durability studies can be directed in order to examine its properties over the long haul.

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