RESEARCH PAPER | Engineering | Volume : 6 | Issue : 5 | May 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

Partail Replacement of Coarse Aggregates With Virgin Plastics Granules (Hdpe) in Concrete Mix

KEYWORDS: Vergin plastic granules, compressive strength, coarse aggregate, cement concrete.

Tanveer Asif Zerdi	Md Yusuf	Mohd Minhajuddin
Director, Professor & H.O.D Civil Engineering, Dept K.C.T.E.C, C/o Dr Meenaz Hospital H.NO. 5-408/40/1&2, Near KBN Medical College,Roza B, Kalaburgi. Karnataka India	U.G STUDENT Dept Of Civil Engineering V.T.U University, K.C.T.E.C Kalaburgi Karnataka.	U.G STUDENT Dept Of Civil Engineering V.T.U University, K.C.T.E.C Kalaburgi Karnataka.

Mohammed Firasat Waseem	Mehreen Naaz Zerdi
U.G STUDENT Dept Of Civil Engineering V.T.U University, K.C.T.E.C Kalaburgi Karnataka.	Student Saint Marry, Kalburgi, Karnataka, India

ABSTRACT *Due to rapid population growth and their consistent necessity the use of plastic articles is increasing regularly. The study is focused on the use of granulated virgin plastics as a partial replacement of coarse aggregates. The aim was to investigate the characteristics of concrete with the addition of virgin plastic and comparing it with the control concrete, there by determining the advantages and disadvantages of doing so. Regarding this topic less work is found to be carried out, therefore authors decided to do the work under consideration. In the lab concrete was mixed cast, cured and tested. The fresh concrete was tested for slump test, while the hardened concrete for compressive strength. The control and 10%, 20% and 30% weight replacement of coarse aggregate with virgin granulated plastics. It was found that addition of virgin plastic granules in concrete resulted in the formation of light weight concrete.*

1. INTRODUCTION

The research study to be undertaken intended trod determine the efficiency of using virgin plastics granules in production of concrete Utilisation of these materials is a partial solution to environmental and ecological problems.

Use of plastics not only helps in getting them utilised in concrete ,it helps in reducing the cost of concrete making, numerous indirect benefits such as cost, saving energy etc.

The use of Virgin plastics materials in building construction is a great idea , and the high demand for construction materials makes them a favourable medium in which to virgin plastic materials.

Most concrete structure are produced using normal weight aggregates .However there are certain instances where light weight concrete is desirable , raising the needs for partial or total replacement of aggregate with a lighter substitute.

The evolution of concrete mix production has taken a massive steps over the years. During this period, various types of aggregate have been used . The major role of aggregate in concrete is to provide strength. in instances where light weight concrete is required , a lighter aggregate made from virgin plastics can be adopted.

In this research work Virgin plastic granules were used as a partial replacement to natural coarse aggregate (NCA) of concrete. Intended percentages of virgin plastic granules were in varying percentages from 0% to 30% with a increment of 10%. (0%, 10%, 20%,30%) The compressive strength of each sample was determined and compared with conventional concrete mix. The use of Plastic in concrete mix for a given w/c ratio, reduces the tensile andCompressive strength and also lower the density.[5]

The main focus of researchers was on the compressive strength of concrete containing plastics and very less attention was given to other properties of concrete.[1]

2. OBJECTIVES

* To investigate the properties of concrete when virgin plastics in granulated form is used as a partial replacement of coarse aggregate in concrete.

* To study the material (concrete constituents and virgin plastic granules) characteristics.

*To Study characteristics of Concrete with virgin plastics granules as coarse aggregate.

*To know its applications in construction industry.

3. EXPERIMENTAL PROCEDURES

3.1 Materials Used: In this research work plastic coarse aggregates (VPCA) of 5 to 8 mm nominal size were used as a partial replacement to natural coarse aggregate (NCA) to produce modified cement concrete. The following materials were used in this research work.

3.2 Cement: It is a important building material. Portland pozzolana cement (PPC) ,conforming to IS:8112-1986 was used. Details of its properties are given in table-1 below-

Volume : 6 | Issue : 5 | May 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

Table-1 Properties of cement

Sl. No	Material Properties	Cement Test Results
1.	Initial Setting Time	47 minutes
2.	Final Setting Time	330 minutes
3.	Standard Consistency Test	40%
4.	Specific Gravity	2.69
5.	Fineness	5%

3.3 Coarse Aggregates:

coarse **A**ggregates were collected from nearby locality conforming to specifications of IS:383-1970 and tested. The test results of coarse aggregate is shown below in table -2 below-

Table-2 Test results of coarse aggregate

Sl. No	Material Properties	Basalt Coarse Aggregates
1.	Specific Gravity	3.0
2.	Bulk Density	1581.196 kg/m^3
3.	Water Absorption	0.54%
4.	Fineness Modulus	4.9
5.	Aggregate Impact Value	18.13%

3.4 Fine Aggregate : Natural river sand which is locally available obtained from the Bheema river of Shahapur Taluk is used as fine aggregates. The physical properties of sand obtained from the tests carried out are given in below table 3.2.

Table 3.2 Physical Properties of Fine Aggregates

	Material Properties	Natural River Sand
1.	Specific Gravity	2.60
2.	Water Absorption	2.3%
3.	Fineness modulus	2.7
4.	Zone	II
5.	Moisture Content	4.74%
6.	Bulk Density (Loose)	1.414 gm/ml
7.	Bulk Density (Compacted)	1.596 gm/ml
8.	Bulking of Sand	6.35%

3.5 Water: It is a important ingredient which actively plays a part in the chemical reactions. It should be a potable water free from organic matter and pH value should be between 6 to 7.

3.6 Virgin Plastic : virgin plastics, articles of High density polythene (HDPE), materials were collected other locations of nearby locality as shown in fig.-1 below. These were cleaned and dried. The virgin plastics articles were shaped and cut to required size.

Fig-1 Mixture of collected virgin plastics

Modification of plastic aggregate was done by heat treatment at a temperature between 160°C to 200°C in Plastic Granule virgin Machine (PGVM). Then aggregate was cooled at room temperature by removing it from the machine.

3.7 Methods: Cement Concrete Mix M20 was chosen for analysis. The raw material were mixed in specified proportion of 1:1.5:3 (1 cement : 1.5 coarse sand : 3 stone aggregate of 20 mm nominal size) and suitable water with adopting water cement ratio as 0.50. The experiment were conducted replacing natural coarse aggregate (NCA) with virgin plastic coarse aggregate (VPCA) of 5 to 8 mm nominal size. The samples were prepared in various proportions. Details are shown in table no-3 as below-

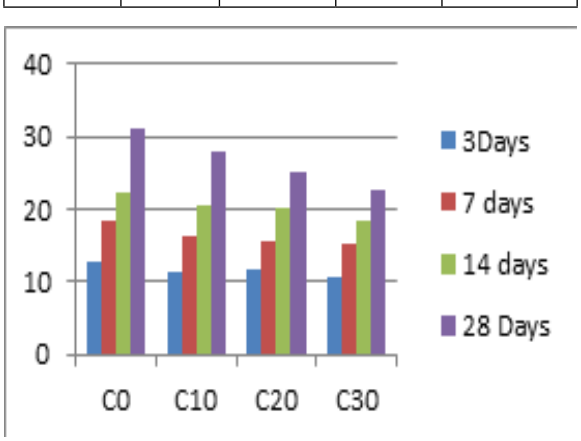
Table-3 Samples of various proportions

Sample Series	Description of various Mix Proportions
C0	100 % Crushed stone aggregate of 20 mm nominal size
C10	(10% Recycled plastic aggregate + 90% Crushed stone) both of 20 mm nominal size
C20	(20% Recycled plastic aggregate + 80% Crushed stone) both of 20 mm nominal size
C30	(30% Recycled plastic aggregate + 70% Crushed stone) both of 20 mm nominal size

The mixing of various ingredients were done in a proper manner and a homogeneous mixture was obtained with proper coating of cement on the aggregates. Suitable numbers of cubes of concrete in suitable mould size (15cmx15cmx15cm) were made and cured for specified temperature and time. The compressive strength of various samples were tested by compression machine. Test results are tabulated below –

Table-4 Compressive strength of Cubes of different proportions

Sample Series	Compressive Strength (N/mm²)			
	3Days	7 days	14 days	28 Days
C0	12.63	18.60	22.45	31.27
C10	11.40	16.50	20.40	27.90
C20	11.91	15.70	20.10	25.20
C30	10.66	15.40	18.50	22.80



Volume : 6 | Issue : 5 | May 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

The compressive strength of concrete cubes of various proportions cured for 3, 7, 14 and 28 days are shown in table no-4.

4. EXPERIMENTAL RESULTS AND DISCUSSIONS

The results of experimental investigations on use of Virgin plastic granules as a partial replacement to natural coarse aggregate (NCA) in concrete were analyzed. Results are as follows

4.1 Use as Constructional Material: It was confirmed that plastic wastes can be disposed off by using it as constructional materials. It can be used as a coarse aggregate replacement in cement concrete.

4.2 Compressive Strength: The compressive strength of modified concrete with Virgin plastic coarse aggregates (VPCA) was compared with conventional concrete and it was observed that the compressive strength in comparison to conventional concrete was achieved up to 89.22% , 78.80%, and 72.91% for mix of waste plastic of 10% , 20% and 30% respectively. It shows that Virgin plastic coarse aggregate (VPCA) up to 30% as a replacement for natural coarse aggregate (NCA) can be used in light weight concrete structure successfully. However higher percentage more than 30% is not acceptable as the compressive strength is considerably reduced.

4.3 Cost Economy: By producing light weight concrete with use of Virgin plastic coarse aggregate (VPCA) there will be reduction in cost of raw materials and minimization of disposal of polymer waste.

5. CONCLUSION

Following are the conclusions can be made based upon the studies made by various researchers:

* within this study the maximum compressive strength is obtained at 10% replacement, but still it is less than the controlled concrete strength but strength is sufficient enough to be useful as M20 grade.

* For a given water content , The use of plastics in the mix lowers the density, compressive strength.

* Virgin plastics can be used to replace some of the aggregates in concrete mixture. This contributes to reducing the unit weight of the concrete .this can be very applicable when requiring light weight concrete.

* Virgin plastic aggregates can be used to cool the inside of buildings in areas of high temperatures because it does not conduct heat**.**

REFERENCES

1. Dr Muhammad Maqbool Sadiq, Muhammad Rafique Khattak, "Literature Review On Different Plastic Waste Materials Use In Concrete". International Journal Of Emerging Technologies And Innovative Research June 2015, Volume 2, Issue 6, Issn (Online): 2349-5162, Pp.1800-1803
2. Fahad K.Alghantani, M Iqbal Khan, Gurmel Ghataora, Samir Dirar, "Lightweight Concrete Containing Recycled Plastic Aggregates". International Conference On Electromechanical Control Technology And Transportation (Icectt May2015), Pp.587-533
3. Kasib R. Malak, "Use Of Plastic In A Concrete Mixture As Aggregate Replacement" International Journal Of Engineering, Education And Technology Volume 3, Issue 2, 01/04/2015 Issn (Online): 2320-883x, Pp.1-6
4. Lakshmi.R, Nagan.S, 2010, "Studies On Concrete Containing E Plastic Waste". International Journal Of Environmental Sciences Volume 1, No 3 ,2010 Issn (Online): 0976 – 4402, Pp.270-281
5. M.Muzafar Ahmed, Dr.S Siddi, April 2015, "Use Of Waste Plastic In The Production Of Light Weight Concrete". International Journal & Magazine Of Engineering, Technology, Management And Research |April 2015|, Issn No (Online): 2348-4845, Pp.365-369
6. Md Hashmath, Md Meraj, August 2015, "Experimental Study On Utilization Of Waste Plastic As Aggregate In Cement Mortar" International Journal Of Engineering Sciences & Research Technology |August 2015| Issn: 2277-9655, Pp.207-214
7. P.Krishna Prasanna, M.Kanta Rao, "Strength Variations In Concrete By Using E-Waste As Coarse Aggregate". International Journal Of Education And Applied Research Vol. 4, Issue Spl-2, Jan - June 2014 Issn: 2348-0033 (Online), Pp.82-84