Manohar Tatma, 11:1
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Experimental Study Of Mix Design Of Concrete By Using Sand With Plastic Waste

M.Tech. Scholar Manohar Tatma, Prof. Sachin Jat
SIRT Bhopal

Abstract- Cement concrete are designed to resist the disastrous surrounding effects such as high temperature variations, high humid environments, coastal areas, industrial are as and other pollutant types. Engineers are continuously studying its properties and performance by blending sever alwaste and modern materials in cement or other aggregates. The major advantage of these materials is the replacement of cement or othering redients partially in concrete and presenting the comparable cementations property. The use of waste material can consume these materials and also saves the principal ingredients of concrete. This can also improve the properties of concrete in fresh and hyd rated states or may presents the properties comparable to the basic propertie of concrete. In the current study a set of experiments had been performed to Compare the use of one type of mixes formed by replacing and with Plastic waste. and was replaced in different proportions such as 5%,10%,15% And 20 % by these materials. The properties of concrete are studied for 7 days ,14 days , 21 days and 28 days.

Keywords- Plastic waste, 5%,10%,15% And 20 % by these materials

I. INTRODUCTION

Utilization of plastic waste or other waste materials in preparing concrete for various civil engineering projects is a subject of high significance. Integration of extra materials in concrete or mortar affects its several characteristics such as strength, compaction factor and other relative performances. There are various purposes of applying additional materials as substitute to cement and other components in concrete – first is the financial saving obtained by replacing a considerable part of the aggregates with these materials and second is saving of materials. The ecological aspects of cement are now receiving more concern of researchers, as cement developing is liable for about large amount of total worldwide waste emissions from manufacturing sources. The trend of mixing several kinds of additional materials in building engineering is now growing. This has double advantage -

(a) To reduce the quantity of deposited waste.
(b) To conserve natural resources.

Partial substitution of sand or cement in concrete minimizes the energy consumption and thus, decreases the global warming. Current practice may permit up to a certain limit of reduction in the content of sand in the concrete mix.

II.ADDITIVES USED IN THE PRESENTSTUDY

Cement and sand are the main materials needed for fulfilling the modern infrastructure needs. As an outcome, the construction and concrete industry worldwide is facing growing challenges in conserving material and energy resources, as well as reducing its CO2 emissions. According to the International Energy Agency, the main concern for cement

International Journal of Science, Engineering and Technology

An Open Access Journal

producers is the increase in energy efficiency and the use of substitute wastes or other waste materials. Consequently, it is converting into employ the substitute material in cement concrete. Plastic waste is a significant material utilized in the building production. During the last decade, considerable attention has been given to the use of plastic waste as a partial replacement of plastic waste to produce high-strength concrete. Plastic waste is added to element concrete to improve its properties,

In particular its compressive strength, and other resistance. Plastic waste consists of fine particles with particles very small to the size of the average cement particle size. Because of its extreme fineness and plastics content, plastic waste is a very effective material particle. Plastic waste is formed from plastic factories during the breaking of plastic parts, and almost 10 – 15 % of the processed plastic is converted into the waste. Deletion of the plastic waste from the plastic places is a noteworthy environmental trouble today. Though, waste material from plastic industry can be used to enlarge several properties of concrete.

It has been analyzed that typically compressive strength increased with accumulation of this waste in place of sand. Thereby fore, employment of the plastic dust in a varietyof industrial sectors particularly the civil engineering projects, would aid to defend the surroundings. Reprocess of these waste materials in construction industry is an inventive run towards sustainable and ecological construction. Utilization of waste materials in construction has been considered as ecological, however, this thought has been not accepted widely between the researchers as these materials imposes severe deleterious effects on the concrete.

But, through proper concrete mix design the reprocessed concrete can achieve target strength and is appropriate for broad variety of applications in Civil engineering. To estimate the efficiency of plastic waste as substitute Construction material, Following properties of concrete were requisite to be tested.

1.Compressive strength after different curing periods
2 Initial and final setting time
3 Workability

III.METHODOLOGY

Table 1 parameters identified and testing techniques

PARAMETERS	SIGNIFICANCE	TESTING
Compressive Strength **(7 Days)**	In 7 days, concrete can gain almost 65 % of The28 days compressive strength.	Compression testing Machine
Compressive Strength **(14 Days)**	In 14 days, concrete can gain almost 68 % of The28 days compressive strength.	Compression testing Machine
Compressive Strength **(21 Days)**	21-day test may be help to detect potential problem with concrete or testing procedure at the lab. In 21 days, compressive strength is almost 90 % of the 28 days strength.	Compression testing Machine
Compressive Strength **(28 Days)**	To evaluate quality and characteristics of concrete. Concrete mixes are recognized by their respective 28 days strength.	Compression testing Machine

PARAMETERS	SIGNIFICANCE	TESTING
Initial Setting Time	Time period available for the transportation and placing of concrete after mixing. It marks roughly the end of the period when the wet mix can be moulded into shape.	Vicat's Apparatus
Final Setting Time	The final setting time is the point at which the set cement has acquired a sufficient firmness to resist a certain defined pressure.	Vicat's Apparatus
Workability	Workability represents the effort which is to be done to compact the concrete in a given module.	Slump Cone Test

Collection of waste materials

↓

Replacement of sand in concrete with these materials in 5%,10%,15% and 20% weight of ingredient

↓

Evaluation of strength, setting times and workability of concrete from above mention tests

↓

Comparison of results for the materials on each selected parameter

IV.EXPERIMENTAL WORK REPLACING SAND

Experiments had been performed to compare the use of type of mixes formed by replacing in sand by plastic waste in used together. Sand was replaced in different

International Journal of Science, Engineering and Technology

An Open Access Journal

proportions such as 5%, 10%, 15% and 20% by these materials. The ingredients are mixed in 1:1:2 proportions. The properties studied are 7 days, 14 days, 21 days and 28 days compressive strengths and compaction factor. Cube moulds of 15 x 15 x 15 cm had been used for casting cubes. The weight of constitutes and waste materials obtained by concrete mix design, for each percentage of replacement has been presented in Table 2.

Table 2 Ration of weight of each constituent (Kg) in concrete for preparing mixed.

Water	Cement	Sand	Coarse aggregate
0.5	1	1	2

Table 3 Proportion of ingredients for mixes by replacing sand by plastic waste.

Weight of Materials (Kg)				
% Replacement	Cement	Sand	Aggregate	Plastic Waste
0	4	4	8	0
5	4	3.8	8	0.2
10	4	3.6	8	0.4
15	4	3.4	8	0.6
20	4	3.2	8	0.8

Table 4 Result of compression test after 7 days for C1 mix concrete mix in MPa.

S.No.	% Replacement	7 Days	
		Compressive strength N/mm2	Average N/mm2
1	0%	25	24.96
2		24.96	
3		24.92	
4	5%	24.85	24.8
5		24.75	
6		24.8	
7	10%	24.55	24.6
8		24.6	
9		24.65	
10	15%	24.3	24.25
11		24.2	
12		24.25	
13	20%	23.2	23.25
14		23.25	
15		23.3	

Table 5 Result of compression test after 14 days for C1 mix concrete mix in MPa

S. No.	% Replacement	14 Days	
		Compressive strength N/mm2	Average N/mm2
1	0%	26	25.65
2		25.65	
3		25.92	
4	5%	25.35	25.3
5		25.3	
6		25.25	
7	10%	25.4	25.45
8		25.45	
9		25.5	
10	15%	25.55	25.55
11		25.5	
12		25.45	
13	20%	24.8	24.85
14		24.85	
15		24.9	

Table 6 Result of compression test after 21 days for C2 mix concrete mix in MPa.

S. No.	% Replacement	21 Days	
		Compressive strength N/mm2	Average N/mm2
1	0%	28.11	28.13
2		28.13	
3		28.15	
4	5%	27.9	27.9
5		27.87	
6		27.93	
7	10%	27.65	27.6
8		27.55	
9		27.6	
10	15%	27.45	27.35
11		27.3	
12		27.35	
13	20%	26.7	26.75
14		26.8	
15		26.75	

Table 7 Result of compression test after 28 days for C3 mix concrete mix in MPa.

S. No.	% Replacement	28 Days	
		Compressive strength N/mm2	Average N/mm2
1	0%	31.75	31.8
2		31.85	
3		31.8	
4	5%	31.6	31.6
5		31.55	
6		31.65	
7	10%	31.3	31.25
8		31.25	
9		31.2	
10	15%	30.83	30.85
11		30.85	
12		30.87	
13	20%	30.2	30.15
14		30.25	
15		30.15	

International Journal of Science, Engineering and Technology

An Open Access Journal

Table 8 Result of compression test for concrete mix in MPa.

S. No.	% Replacement	7 Days		14 Days		21 Days		28 Days	
		Compressive strength N/mm2	Average N/mm2	Compressive strength	Average N/mm2	Compressive strength	Average N/mm2	Compressive strength N/mm2	Average N/mm2
1	0%	25	24.96	26	25.65	28.11	28.13	31.75	31.8
2		24.96		25.65		28.13		31.85	
3		24.92		25.92		28.15		31.8	
4	5%	24.85	24.8	25.35	25.3	27.9	27.9	31.6	31.6
5		24.75		25.3		27.87		31.55	
6		24.8		25.25		27.93		31.65	
7	10%	24.65	24.6	25.4	25.45	27.65	27.6	31.3	31.25
8		24.6		25.45		27.55		31.25	
9		24.65		25.5		27.6		31.2	
10	15%	24.3	24.25	25.55	25.55	27.45	27.35	30.83	30.85
11		24.2		25.5		27.3		30.85	
12		24.25		25.45		27.35		30.87	
13	20%	23.2	23.25	24.8	24.85	26.7	26.75	30.2	30.25
14		23.25		24.85		26.8		30.25	
15		23.3		24.9		26.75		30.15	

4.1 Slump Cone Test

Table 9 Result of workability test

MIX	% Replacement	Slump Value (mm)
M25	0	90
	5	88
	10	85
	15	82
	20	80

V.RESULTS AND DISCUSSION

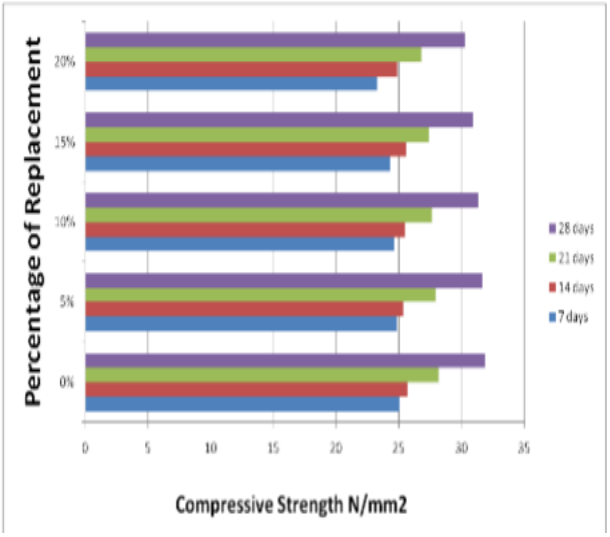
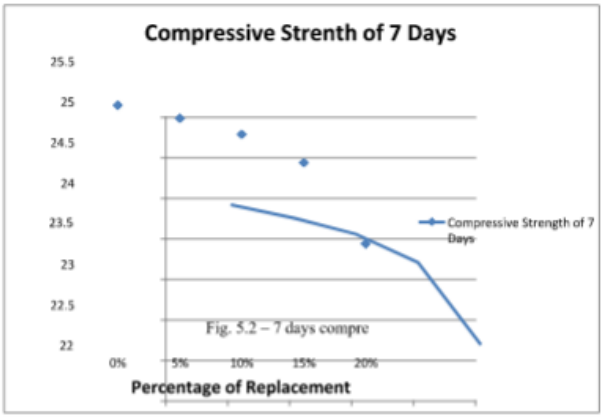


Figure 6 Variation of compressive strength for different replacement.



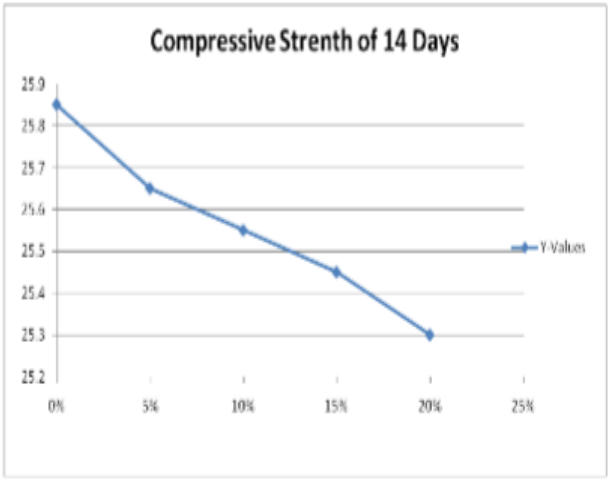


Fig. 7 Compressive strength for C1.

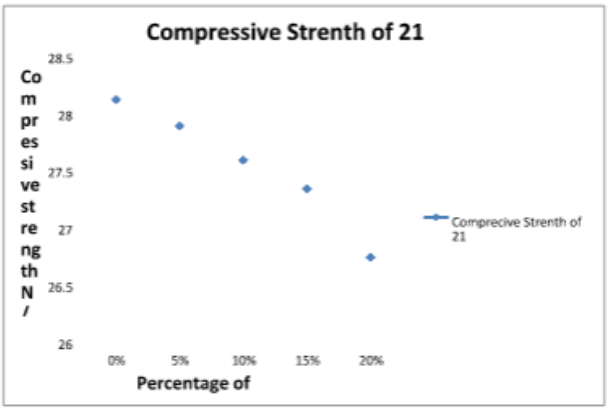


Fig. 8 21 days compressive strength for C2.

International Journal of Science, Engineering and Technology

An Open Access Journal

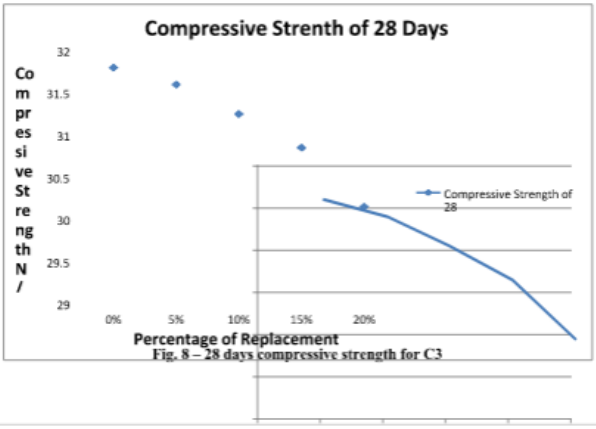


Fig. 8 – 28 days compressive strength for C3

Fig.8 28 days compressive strength for C3

2.Slump Cone Tests

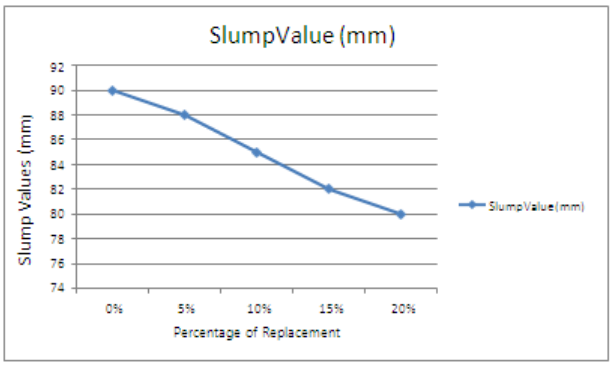


Fig.9 Change in slump value for Mix.

VI.CONCLUSIONS AND FUTURE

Following are the conclusions of the present work

1. It is observed that when the percent replacement increases compressive strength decreases.
2. Slump value is found to be decreasing by increasing the percentage of plastic waste.
3. The slump value for sand replacement with plastic waste up to 20% shows a decrease of about 9%.
4. Reduction in compressive strength for sand replacement with plastic waste in concrete is only 1%, 2%, 3% and 5% at the age of 28 days after replacement of 5%, 10%, 15% and 20% respectively.
5. Hence, from above results it has been recommended to replace sand upto15% with Plastic waste for good compressive strength and optimum workability.
6. Test on plastic waste replaced concrete shows that the properties of this concrete are satisfactory.

FUTURE SCOPE OF PRESENT WORK

1. This work can be extended for high grade of concrete.
2. Mix design of concrete by using other waste materials.

REFRENCES

1. An Experimental Study on Partial Replacement of Sand with Crushed Plastic in Concrete. (M. Usha Rani and J.Martina ,2016).
2. High Performance Concrete Using M Sand. (Magudeaswaran. P, Dr. Eswaramoorthi. P i. ,2016).
3. Study on performance of concrete with over-burnt plastics aggregates and micro- silica admixture. (K Praveen, Dhanya Sathyan, K M Mini ,2016).
4. Cement Replacement by Fly Ash in Concrete. (R. D. Padhye, N. S. Deo. ,2016).
5. Manufactured sand with silica fume, an alternative to river sand and in concrete industry. (Dr. T Suresh Babu, M Anveshkumar ,2016).
6. Experimental Investigation of Using Concrete Waste and Plastic Waste as A Coarse Aggregate. (T. Subramani , S. Kumaran ,2015).
7. Properties of Concrete made with Waste Clay Plastic as Sand Incorporating Nano SiO2. (Davoud Tavakoli, Ali Heidari and Susan Hayati Pilehrood ,2014).
8. An Experimental Study on Properties of Fly Ash Plastics. (Er. Rinku Kumar1, Er. Naveen Hooda,2014).
9. Effect of waste plastic kiln dust with partial replacement of cement with adding super plasticizer in construction of Paver Blocks. (Sharda Sharma, Ritesh Mall and Khalid Raza, 2014)
10. Partial Replacement of Sand with Quarry Dust in Concrete. (Chandana Sukesh, Katakam Bala Krishna, P. Sri Lakshmi Sai Teja, S. Kanakambara Rao ,2013).
11. An Innovative Method of Replacing River Sand by Quarry Dust Waste in Concrete for Sustainability. (Dr. P.B.Sakthivel, C.Ramya, M.Raja, 2013).