Utilization of Plastic Waste in Concrete

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Abstract- Due to the rapid economic growth and development of the country, many infrastructure projects have been implemented. This process creates questions for people to solve the problems created by this development. The problems mentioned are mainly material shortage, waste generation and other things. This project uses M20 grade waste plastic instead. The amount of waste transfer involved in this project is 0.05%, 0.10%, 0.15%. All of the test items are different from our example. Tests are made for the materials used in the concrete mix. The results of the data analysis show that the compressive strength is simultaneously affected as the plastic waste material changes. As the percentage of plastic added increases, the compressive strength decreases.

Keywords: - Plastic Waste, Compressive strength.

INTRODUCTION

As the world population increases, many types of waste are produced. The production of non-biodegradable and non-biodegradable wastes has brought along the problem of waste disposal along with the increasing number of users. One solution to this crisis is to turn waste into useful products. Many government agencies, private organizations and individuals have completed or have completed many studies and research on the effectiveness, environmental design and performance of waste management. world from environmental pollution. According to research, there are 45 types of plastic waste produced in Nagpur alone.96 tons per day. Therefore, the problem of disposal of these wastes is increasing day by day. The solution to this problem is to transform waste products into useful products. While the development continues day by day, the construction and maintenance of the building is in good condition. That's why we're looking for new ideas on how to use waste in cement concrete.

METHODOLOGY

The main aim of the project is to produce concrete made from recycled materials. Since plastic waste is not easy to dispose of, it can affect the environment. Reusing plastic waste in the concrete industry is considered the most practical application. It reduces environmental pollution and lowers equipment costs.
1 Materials 2. Cement 3. Aggregate (Coarse and Fine) 4. Water 5. Plastic Granules
1.Material: Use concrete mix: each mix contains sand, aggregate, cement and water-cement ratio. This composition has 0% waste plastic content and a curing time of 7, 14 and 28 days.
2. Sample preparation: Concrete sample is prepared in appropriate proportions, three parts are 12 cubes with the dimensions of 45. (150 X 150 X 150) mm will be poured. A total of samples of the cube will be stored during the 7, 14 and 28 day curing period prior to testing.

ANALYSIS

Materials

Cement: Ordinary Portland Cement
Fine Aggregate: Local water sand Coarse Aggregate: Local crushed blue granite
Plastic: Plastic waste
Water: drinking water.

Tests

1. Standard Consistency Test IS 12269: 1987 Observations: - showed 34 cement consistency. had a standard consistency of 32-35. Test start time and cement reading end time: Start time - 30 minutes End time - 600 minutes Maintenance: - Cement - 500 gr Water - 131 gr Final appointment time 40 minutes 43 - 345 minute
2. Cement: - OPC (Class 53) Sand Test for Alluvial Content. Water - 50ml Sand - 100ml

Determination - 3 hours Volume 1 = 55ml Volume 2 = 85-90ml Specific gravity of fine aggregate. 3.Sand - 300 g dry. g = 2.65

3. Fineness modulus of sand Sand-4000 gm Storage - Fine-2.1-2.6 Medium -2.6-2.9 Coarse-2.9-3. fineness modulus = 2.94. coarse aggregate-FM = 2.9-4.2

MIX DESIGN

Requirements for mixing materials Concrete Grade - M20 Cement Type OPC 53 Grade & IS8112 Maximum Nominal Size of Aggregate - 20mm. Minimum cement content - 300kg/m3. (IS 456:2000) Maximum Water Cement Ratio:- (IS 456:2000) Workability = 75 mm to 100 mm Exposure Conditions - Medium Concreting Method - - Manual Control Degree. Aggregate Type - Ground angular aggregate Maximum cement content: - 450kg/m3. (456 2000 ml)

Test data. Cement used: OPC 53 grade conforming IS 8412 Cement Specific Gravity - 3.15 Specific Gravity: coarse Aggregate - 2.90. by Fine Aggregate -2.65 water absorption:- Coarse Aggregate - Nil Fine Aggregate - 1.00% Free Surface Moisture: - Coarse Aggregate - N/A Fine Aggregate - N/A Sieve Analysis: - Coarse Aggregate - Fine Aggregate - Zone II.

Proportioning target strength : Average Force f'ck = fck + 1.65 x s = 20 +1-65x4 = 26.6 N/mm² From Table I (IS 10262: 2004 Standard deviation = 4 N/mm² Choose W/C ratio IS 456 from Table 6 Maximum W/C ratio=0.48 Use w/c ratio empirically=0.40 Select water content. From Table 2 (10262 12009), the highest water level of is 20mm aggregate = 186 lit. Estimated water content of 100 mm slums = 186X6/100 X 18 = 197 16 lit.

Calculate cement content w/c ratio = 0.48 Cement content / 410 kg = 197 kg. .42 < 450 kg/min

Volume of coarse and fine aggregate. from IRC: Made for 4.2.6 in IRC:SP46-2013 Fine aggregate content should be 46-68% of the total aggregate Depending on the maximum coarse aggregate amount So as a general rule, take Aggregate volume = 0.50 So of course aggregate volume = 0.50 Fine aggregate = 0.50

Mixture calculation [w/c Ratio = 0,48] Concrete volume = 1m^3 Cement volume = Cement mass/Sp.Gravity X1000 = 410.42/3.15 * 1000 = 0.130 m^3 Water Volume = Water Mass/Sp.gravityX1000 = 197/1 * 100 197m^3 total aggregate volume = [1-(0.130+0.197)] = 0.67 m² coarse aggregate mass = 5*coarse aggregate volume* Sp. Gravity of coarse aggregrate*1000 =0.665 X 0.50 X 2.90 X 1000 = 964.27 kg

Size = 15x15x15 cm. ratio 2.36 1.1.5:3 water = 15. 539X0.48 = 7.458 8 kg For 9 cubes = 0,15X0-15 X0

(5X9X 1.15)= 0,0349 m3= 0,0349 X2400= 88.76kg Sand for 9 cubes= 1 + 203 + 2,36= 15,539 kg 9 küp = 83.76/1+2.03+2.03= 31.54 kg 9 cubic meters of coarse aggregate= (83.76/(1+2.03 12.36)) X2.36= 36.67 kg 20 mm adds (%40) = 25 Kg 10 mm adds (%30) = 11 Kg

Sr. No.		Quantity	Proportion
1.	Cement	411kg/m^3	1
2.	W/C Ratio	0.08	0.08
3.	Water	197kg/m^3	
4.	Fine Aggregate	837kg/m^3	
5.	Coarse Aggregate	972kg/m^3	
6.	20mm (30%)	292kg/m^3	
7.	10mm (70%)	680kg/m^3	
8.	Waste plastic	4.1kg/m^3	

Plastic Gradient for each specimen

Sr. no.	Plastic Gradient Variations	Specimen for each Variation
1.	0	3
2.	0.5	3
3.	0.10	3
4.	0.15	3
Total	-	12

RESULT

7 Day Compressive strength

% of plastic	1N/mm^2	2N/mm^2	3N/mm^2
0%	13.33	13.46	13.20
0.05%	12.21	12.26	12.18
0.10%	9.16	10.63	10.26
0.15%	8.87	9.95	9.23

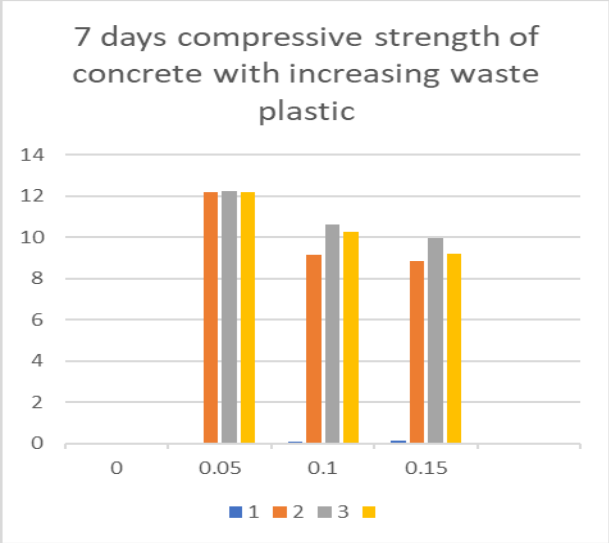

Fig. 7 days compressive strength of 3 specimens

14 Day Compressive strength

% of plastic	1 N/mm^2	2N/mm^2	3N/mm^2
0%	16.12	16.36	16.29
0.05%	13.96	15.64	15.36
0.10%	12.68	14.56	13.61
0.15%	12.89	12.39	13.60

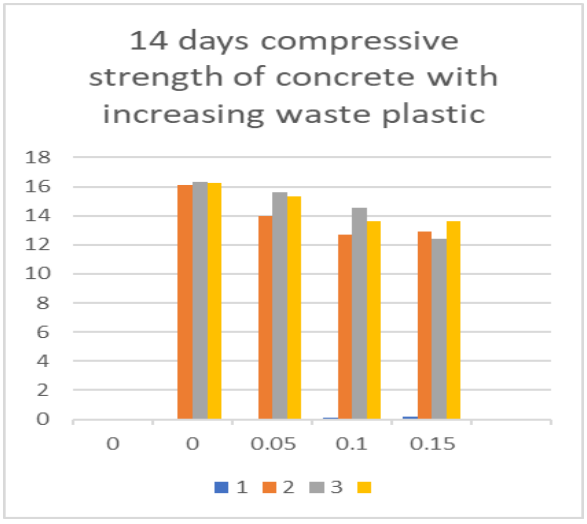

Fig. 14 days compressive strength of 3 specimens

28 Days Compressive strength

% of plastic	1N/mm^2	2N/mm^2	3N/mm^2
0%	19.94	20.02	20.69
0.05%	19.83	19.61	19.41
0.10%	18.73	18.36	18.51
0.15%	17.77	17.96	17.91

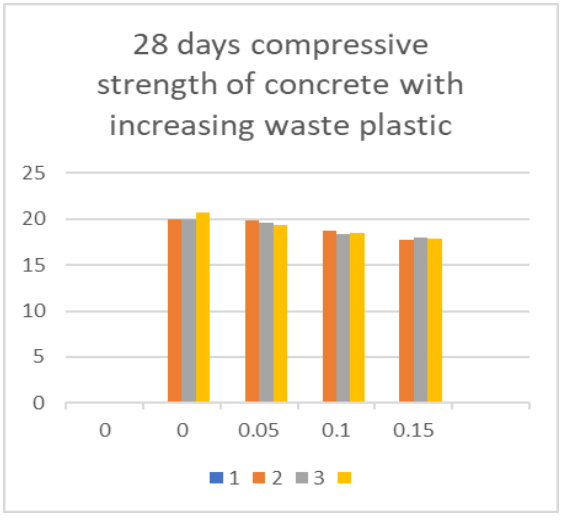

Fig. 28 days compressive strength of 3 specimens

Average compressive strength

Grade of Concrete	W/C Ratio	% of Plastic Waste	Avg = 7 Day Compressive Strength	Avg = 14 Day Compressive Strength	Avg = 28 Day Compressive Strength
M20	0.48	0%	13.33	16.25	20.21
M20	0.48	0.05%	12.21	14.98	19.61
M20	0.48	0.10%	10.01	13.61	18.20
M20	0.48	0.15%	9.35	12.98	17.88

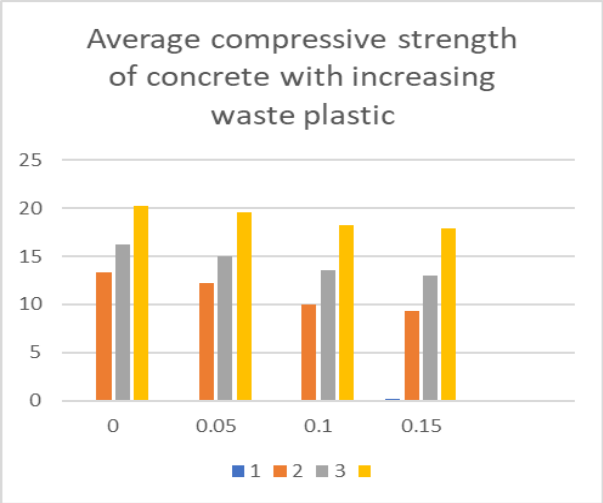

Fig. average compressive strength

CONCLUSION

The compressive strength of waste plastic mix concrete is optimal upto 0.10% after there was a slight reduction in strength was observed. The utilization of plastic waste will greatly reduce the environmental pollution which leads to the cleaner environment. Workability of concrete has been reduced with the increase in percentage of plastic. it is important to carefully consider the potential risks and limitations before using it in construction projects

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