

Experimental Investigation in Developing Green Concrete from Brick Dust

Sourabh Rajoriya¹, Danish Ansari²

M. E. Scholar (Civil), Department of Civil and Environment Engineering, NITTTR Bhopal, India¹

M .Tech Scholar (Civil), Department of Civil and Environment Engineering, NITTTR Bhopal, India²

ABSTRACT: In the recent days, cement production & consumption is getting very large especially in developing country like India. India is the second world largest country which produces cement so now a day's green concrete constructions are more widely using and it is capable for sustainable development characterized by application of industrial waste quarry dust, wood ash, brick dust etc. to reduce consumption of cement and environmental friendly . It would be economical in construction industries and there will be reduction in pollution by these new innovations in cement.

KEYWORDS: Brick Dust, sand, supplementary cementations materials, Coarse and fine aggregate.

I. INTRODUCTION

Green concrete is a term given to a concrete that has had extra steps taken in a mix design and placements to ensure a sustainable structure and a long life cycle with a low maintenance surface. With the increasing interest of the public, industry and government in sustainable development, environmental assessment in construction is becoming more important. Society and the social changes that have occurred in the world have placed insatiable demands on the construction industry in terms of the world's material and energy resources. The construction industry must address certain consequential issues in the process of achieving sustainable development as it consumes considerable resources and has a significant impact on the environment.

Recently India has taken a major initiative on developing the infrastructures such as express highways, bridges, power projects and industrial construction, etc, to meet the requirements of globalization, in the construction of buildings and other structures concrete plays an important and rightful role and a large quantum of concrete is being utilized.

Green concrete has nothing to do with colour. It is not in green colour. It is concept of thinking environment into concrete considering every aspect from raw materials manufacture over the design to structural design, construction and service life. Green concrete is very often also cheap to produce. Waste can be used to produce new product or can be used as an admixture so that natural sources are used more efficiency and the environment is protected from waste deposits. To avoid pollution and reduce the waste material, the present study is carried out.

II. LITERATURE SURVEY

1. Ms. Monica C. Dhoka (2013), Carried out experimental study on green concrete and described the properties of concrete and its strength with the use of waste materials. She described about green concrete in which we can reduce the pollution in environment by adopting suitable proportion of materials like cement and can improve the durability of concrete under the serve condition.
2. Bambang Suhendro (2014), Analysed that 8 to 10% of the world's total CO₂ emissions take place by manufacturing cement and global warming gas is released by crushing lime stone and clays. He described the term green concrete which is the utilisation of waste material by replacing of quantity of cement. He discussed about environment pollution and its effects in this case study. Now a day's everyone is aware from the environmental effects and global warming which is being increased day due to production of these construction materials specially in

International Journal of Innovative Research in Science, Engineering and Technology

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industries by day so now many countries are utilising waste materials and replacing it of further materials which generally use in making concrete but to observe the proper strength in construction.

3. Garg Chirag & Jain Aakash (2014), carried out study on green concrete to avoid the pollution and re used the material. He described that green concrete is an excellent substituent of the cement because it uses the waste products and give durability and strength than from normal concrete by adopting standard materials for green concrete construction. He observed that 0.9 tons of CO₂ produced per tones from cement production,so by using green concrete, we can reduce CO₂ emission from atmosphere.
4. Patel Ankit Nileshchandra, Prof. Jayeshkumar Pitroda (2013), Performed experimental study on green concrete and describe the feasibility of using stone waste dust in concrete production as the partial replacement of cement and for reducing disposal and pollution problems. He replaced OPC and PPC cement by stone waste dust in the range of 0%,10%,20%,30%,40% and 50% by weight for M-25 Grade concrete. HE also evaluated mechanical properties of specimen on split tensile strength test for 28 days. Finally in results he found that split tensile strength increased up to 30% replacing of stone waste in OPC and 20 % replacement of stone waste in PPC.

III. OBJECTIVE OF EXPERIMENTAL STUDY

There are some objects of this research which are as follows:

- To achieve economy in construction projects.
- To minimize the consumption of cement in construction projects.
- To reduce the pollution caused by producing cement.
- To make eco-friendly environment.
- For adopting the proportions of materials, which can develop good strength with minimum consumptions of cement.

IV. EXPERIMENTAL METHODOLOGY

MATERIALS USED:

Cement: This material is the backbone of construction industries. It is used as a binding material which provides strength in concrete. we had adopted OPC 33 Grade cement in this experimental study. The type 1 is preferred according to IS: 269-1976 which is used for general concrete structures.

Fine aggregate: The fraction from 4.75mm to 150 micron is termed as fine aggregate.

Coarse aggregate: The fraction from 80mm to 4.75mm is termed as coarse aggregate. Its provide strength in concrete.

V. RESULTS & DISCUSSION

A mix m₂₅ grade was designed as per Indian standard method and the same was used to prepare the test samples. The design mix proportion is as follows:

Table-1 Design Mix Proportion

	water	cement	fine aggregate	coarse aggregate
By weight(kg)	191.6	547.42	456.96	1255.475
By volume	0.35	1	0.834	2.29

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Mix proportions

Conventional concrete – 1: 1: 2
 10% replacement – 0.9: 1: 2
 20% replacement – 0.80: 1: 2
 30% replacement- 0.70: 1: 2
 40%replacement – 0.60: 1: 2
 50% replacement – 0.50: 1: 2
 60% replacement – 0.40: 1: 2
 70% replacement – 0.30: 1: 2

Table-2 Compressive Strength on Cubes at 7 Days

Partial Replacement in %	Number of Specimen	Ultimate Load(kN)	Ultimate Compressive Strength(N/mm ²)	Average(N/mm ²)
0.0	1	495	22	
0.0	2	500	22.22	21.85
0.0	3	480	21.33	
10.0	1	460	20.44	
10.0	2	445	19.77	20.36
10.0	3	470	20.88	
20.00	1	340	15.11	
20.00	2	340	15.11	14.51
20.00	3	305	13.55	
30.00	1	250	11.11	
30.00	2	250	11.11	11.25
30.00	3	260	11.55	
40.00	1	185	8.22	
40.00	2	205	9.11	8.66
40.00	3	195	8.66	
50.00	1	120	5.33	
50.00	2	125	5.55	5.7
50.00	3	140	6.22	
60.00	1	65	2.88	
60.00	2	60	2.66	2.66
60.00	3	55	2.44	
70.00	1	45	2.00	
70.00	2	40	1.78	1.99
70.00	3	50	2.22	

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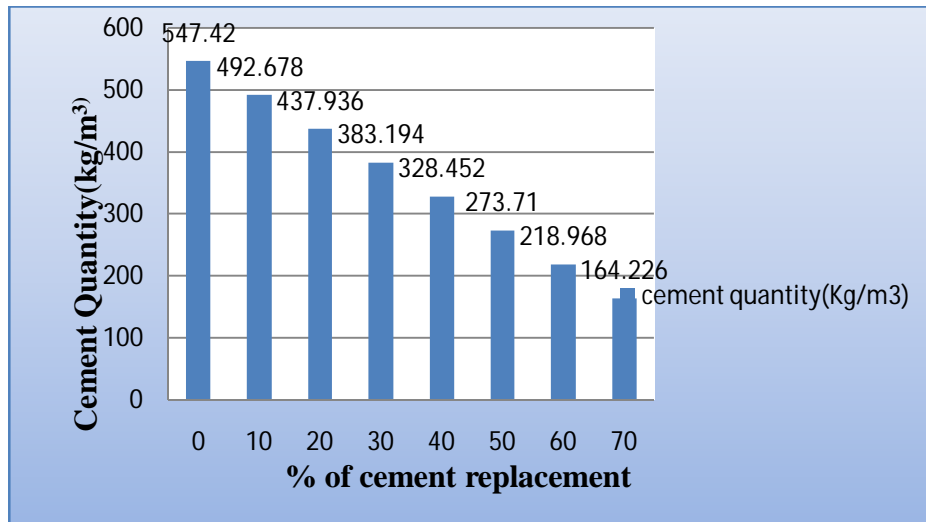


Figure-1 bar chart of cement replacement

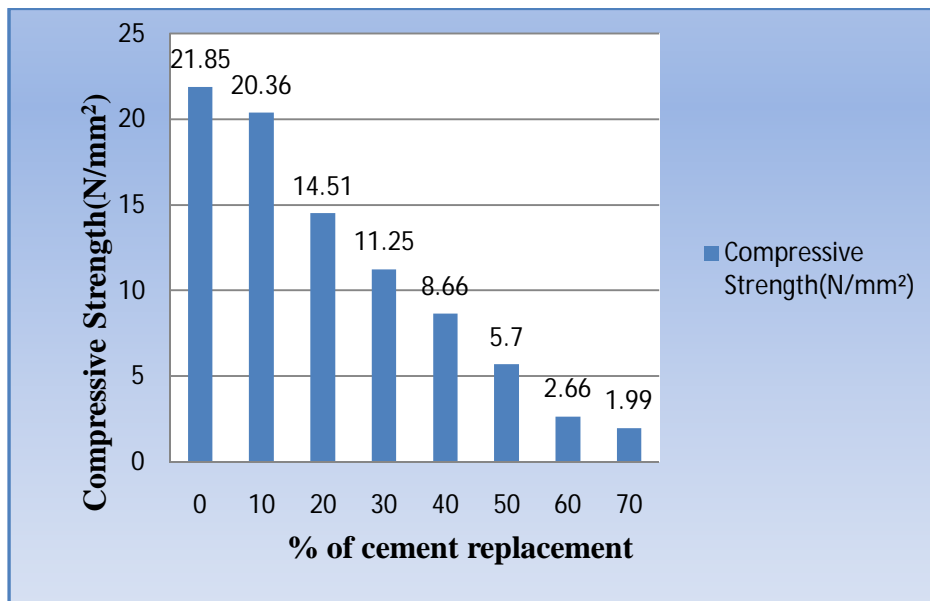


Figure-2 bar chart of avg. compressive strength

ECONOMIC FEASIBILITY

Cost analysis is carried out for the optimum proportion of percentage of brick dust in concrete. The cost is compared to the conventional concrete.

Cost of materials:

- Cost of cement per bag = Rs. 250.00
- Cost of sand per m³ = Rs. 867.20
- Cost of brick per Kg = Rs. 0.20
- Cost of coarse aggregate per m³ = Rs. 561.40

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Table-3 Cost of material of normal concrete/m³

Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	547.42	5/Kg	2737.10
Brick	-	-	-
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			3305.14

Table-4 Cost of material of 10% partially replaced concrete/m³

Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	492.678	5/Kg	2463.39
Brick	54.742	0.20/Kg	10.94
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			3042.37

Table-5 Cost of material of 20% partially replaced concrete/m³

Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	437.936	5/Kg	2189.68
Brick	109.484	0.20/Kg	21.8968
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			2779.6368

Table-6 Cost of material of 30% partially replaced concrete/m³

Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	383.194	5/Kg	1915.97
Brick	164.226	0.20/Kg	32.852
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			2516.862

Table-7 Cost of material of 40% partially replaced concrete/m³

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Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	328.452	5/Kg	1642.26
Brick	218.968	0.20/Kg	43.7936
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			2254.0936

Table-8 Cost of material of 50% partially replaced concrete/m³

Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	273.71	5/Kg	1368.55
Brick	273.71	0.20/Kg	54.742
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			1991.332

Table-9 Cost of material of 60% partially replaced concrete/m³

Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	218.968	5/Kg	1094.84
Brick	328.452	0.20/Kg	65.6904
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			1728.5704

Table-10 Cost of material of 70% partially replaced concrete/m³

Description	Quantity (Kg/m ³)	Cost (Rs.)	Cost of material (Rs.)
Cement	164.226	5/Kg	821.13
Brick	383.194	0.20/Kg	76.6388
Sand	456.96	867.20/m ³	247.67
Coarse aggregate	1255.475	561.40/m ³	320.37
Total cost			1465.8088

From the above figures, it clearly indicates that we have replaced cement by brick dust percentage wise and other materials like fine aggregate and coarse aggregate have been proposed in same quantities. We have replaced cement quantity by quantities of brick dust up to 10 to 70% and performed on UTM and we archived most economical quantities in 70% replacement.

V. CONCLUSION

Based on limited experimental investigation on the compressive strength of concrete, the following observations are made regarding the resistance of partially replaced Brick Dust. Compressive strength of concrete should be increase by

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the percentage of replacement up to 10% and replacement increased compressive strength become reduced. Cost of cement should become low from this project.

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