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Green Mix Concrete

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Abstract— *the aim of this project is to replace raw materials of concrete with waste from industries like Fly ash, Marble powder and Scrap Tyre rubber. Around 163.56 million tonnes Fly ash, 7 million tonnes marble waste and 90,000 metric tonnes waste Tyre are generated every year in India. The degradation of this waste is very long process and hence project is helpful in reducing and recycling the waste. In this Project we have partially replaced Fly ash with cement, Marble waste with sand and waste tire rubber with coarse aggregate. With proper mix design cubes were caste and tested for their strength. It was determined that possibility of usage of these waste in the concrete as aggregate affected positively on the hardened properties of concrete. Green concrete is cost effective and environmentally friendly. It helps to reduce mining of river sand. Moreover, it helps to reduce carbon emissions that were generated from manufacturing cement and crushing of aggregates.*

Keywords— *Fly ash, Waste marble powder, Waste tyre rubber*

I. Introduction

The concrete is made with concrete wastes which are eco-friendly so called as Green concrete. The other name for green concrete is resource saving structures with reduced environmental impact for e.g. Energy saving, CO_2 emissions, waste water. Green concrete is a revolutionary topic in the history of concrete industry. This was first invented in Denmark in the year 1998 by

Dr. WG. Green concrete capable for sustainable development is characterized by application of industrial wastes to reduce consumption of natural resources and energy and pollution of the environment. Green concrete capable for sustainable development is characterized by application of industrial wastes to reduce consumption of natural resources and energy and pollution of the environment. As a rough estimate, approximately 115 million tons of fly ash is being produced annually from thermal power plants in India. However, only 40 million tons of fly ash is used annually in various engineering applications. Different countries of the world has different rate of producing rubber, for instance United States produces 3.6 million tons of rubber per year, Iran produces 100,000 tons of rubber per year, similarly Malaysia produces 200,000 tons of rubber per year. Green concrete is a revolutionary topic in the history of concrete industry. As green concrete is made with concrete wastes it does take more time to come in India because of industries having problem to dispose wastes and it also reduces environmental impact with reduction in CO_2 emission. Use of green concrete can help us reduce a lot of wastage of several products. Various non-biodegradable products can also be used and thus avoiding the issues of their disposal.

II. Methedology

By literature study we found that 5%, 10%, 15%, 20% and 25% of the total mineral aggregates volume can be replaced in concrete. In this project we have replaced specific proportions of cement, fine aggregate and coarse aggregate with Fly ash, marble waste and waste tire rubber respectively. Three cube samples were cast on the mould of size 150*150*150 mm for each 1:1.4:2.7 concrete mix with partial replacement of 5% 10% and 15% of fine aggregate, Coarse aggregate and cement with a w/c ratio as 0.50 were cast. After about 24 h the specimens were de-moulded and water curing was continued till the respective specimens were tested after 7,14 and 28 days for compressive strength and compared with conventional concrete.

III. Materials Replaced

FLY ASH: The fly ash is procured from **Koradi Thermal Power Plant.**

Figure 1: Fly Ash

MARBLE POWDER: The Marble chunks used are of same size as fine aggregate and bought from the local marble supplier.

Figure 2: Marble Chunks

WASTE TYRE RUBBER: Rubber aggregates from discarded tyre rubber in sizes 10-20mm and received from tyre yard.

Figure 3: Waste tyre rubber

Properties Of Materials Used And Concrete

A) CEMENT

Sr. No.	Various test on Cement	Observation	Standard value as per IS code	IS code
1	Initial setting time	118 minutes	30 minutes	IS 4031 (Part 5): 1988
2	Fineness	97%	Not less than 90%	IS 4031 (Part 1): 1996
3	Standard consistency	34%	30% - 35%	IS 4031 (Part 1): 1996
4	Compressive strength	For 3 days		IS 4031 (Part 6): 1988
		11.77 N/mm^2	Should not be less than 11.5 N/mm^2	
		For 7 Days		
		14.32 N/mm^2	Should not be less than 17.5 N/mm^2	

B) Ine Aggregates

Sr. No.	Various Test On Fine Aggregates	Observation	IS Code
1	Fineness Modulus	2.778	IS 383 (Part 1): 1970
2	Specific Gravity	2.47	IS 2386 (Part 3): 1963
3	Water Content	1.21%	IS 2386 (Part 3): 1963

C) Coarse AGGREGAT

Sr. No.	Various Test On coarse Aggregates	Observation	Standard Value
1	Impact Value	4.55%	Less than 30%
2	Abrasion Value	2.62%	Less than 16%
3	Specific Gravity	2.87	2.5 to 2.9

Tests On Concrete

D) Fresh Concrete

Sr. No.	Various Tests On Fresh Concrete	Observation	Standard Value
1	Compaction Factor Test	0.94	0.95 (High)
2	Slump Test	140 mm	100 – 150 (High)
3	Flow Table Test	60%	1
4	VEE-BEE Test	2.9	1- 3 (Semifluid)

E) Hardened Concrete

Compressive Strength

Sr. No.	M30	Compressive Strength in N/mm^2	
		14 Days	28 Days
1	Plain	27.08	35.18
2	05%	21.91	31.21
3	10%	23.16	32.06
4	15%	23.07	31.53

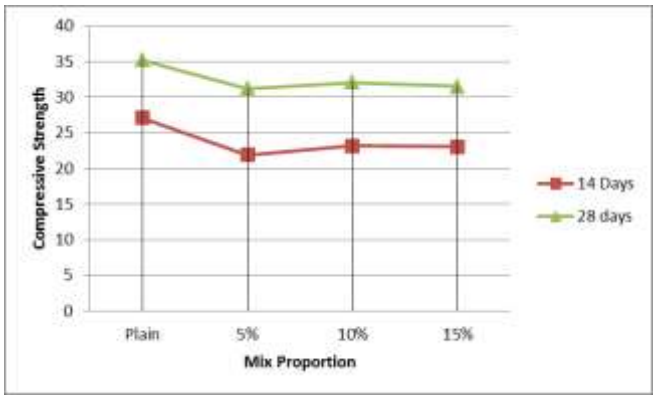

Figure 4: comparison of Compressive strength

Flexural Strength

Sr. No.	M30	Flexural Strength in N/mm^2	
		14 Days	28 Days
1	Plain	3.64	4.15
2	05%	3.27	3.91
3	10%	3.36	3.96
4	15%	3.36	3.93

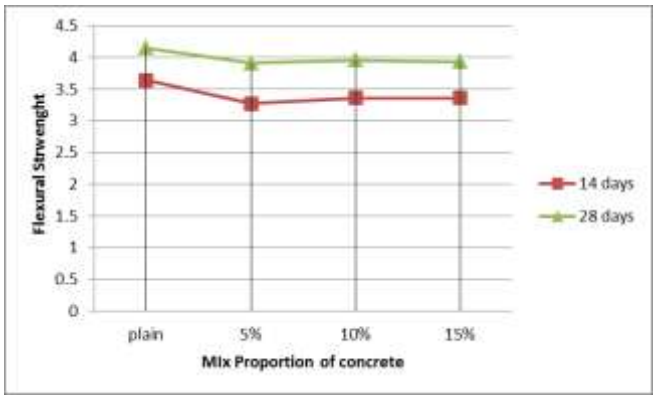

Figure 5: Comparison of Flexural strength

IV. Conclusion

1. The compressive strength and flexural strength of concrete is approximately same for the mix proportion i.e. 5%, 10% and 15% with addition of waste 10% by weight in place of cement, sand and aggregates, further any addition of waste marble powder the compressive strength decreases.
2. It was determined that possibility of usage of the rubber tyre in the concrete as aggregate affected positively on the hardened properties of concrete.
3. The use of marble and fly ash in concrete will reduced the natural sources.
4. By using fly ash the environmental problem will minimized.

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