Recycling of Coconut Shell and Plastic Waste in Concrete by Replacing Coarse Aggregate

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Abstract— Electronics waste was the by-product of plastic industries and additionally it's collected from native space and it contains junk TVs, Radio, CDs, Computers, Chips etc. coconut shells could be a by-product of coconut industries. This treatise shows study on the results of an investigation of result of plastic waste and coconut shells as coarse combination replacement in concrete combine. Concrete mixes containing varied contents of the coconut shells and plastic waste were ready and properties material and concrete like fineness modulus, water absorption, relative density, crushing worth, impact worth, abrasion worth, workability, compressive strength and flexural strength were determined. Concrete of M-40 grade is ready containing coconut shells and plastic waste as a partial replacement of coarse combination in concrete. Plastic waste and coarse combination that passes from 20mm sieve were mixed in concrete. One of the best methods for using waste as re-uses material. The cost of cement used in concrete works is on the increase and unaffordable, yet the need for housing and other constructions requiring this material keeps growing with increasing population, thus the need to find alternative binding materials that can be used solely or impartial replacement of cement. Coconut shells, which are an environmental pollutant, are collected and burnt in the open air (uncontrolled combustion) for three hours and that product is incinerated in muffle furnace at 800oC for 6hrs to produce coconut shell ash (CSA), which in turn was used as binding in partial replacement of cement in concrete production. Reduction of cement usage will reduce the production of cement which in turn cut the carbon dioxide emissions. The time has come for the review of progress made in the field of development of binary blended cement concrete and aggregates.

Key words: Compressive Strength, Workability Plastic waste, Recycle Concrete Aggregate, Coconut Shells, Concrete

I. INTRODUCTION

Concrete is wide used as construction material for varied varieties of structures because of its sturdiness. For a protracted time it had been thought-about to be terribly sturdy material requiring to a small degree or no maintenance. We have a tendency to build concrete structures in extremely impure urban and industrial areas, aggressive marine environments and lots of alternative hostile conditions wherever alternative materials of construction area unit found to be unserviceable. Within the recent revision of IS: 456-2000, one in all the most important points mentioned is that the sturdiness aspects of concrete. That the use of concrete is inevitable. One in all the new waste materials utilized in the concrete trade is recycled electronic waste. For finding the disposal of enormous quantity of recycled electronic stuff, utilize of electronic waste in concrete trade is taken into account because the most possible application. This cause health and atmosphere problem contain lead, metallic element etc. In Bhopal around 425 MT sold-out in market each year. They need been with success utilized in the development trade for partial or full replacement for fine and coarse aggregates. The composition of World Cement Consumption within the year 2010 is 3,313 Million Metric Tons. Among that 7% in Asian nation, 57.7% in China, 9.4% in Developed Countries, 25.9% in alternative rising. The composition of Coconut Production in Asian nation within the year 2009 is 10,894,000 tonnes. Ancient area unit as of coconut cultivation are the states of Kerala (45.22%), Tamil Nadu (26.56%), Karnataka (10.85%) and Andhra Pradesh (8.93%).

II. RELATED WORK

According to a Delhi-based non-governmental organization (NGO) Toxics Link, $1.5 billion price of E-waste is generated domestically in Bharat annually and 8,000 tons a year is generated in Bengaluru, the IT hub of Bharat. Tirupati could be a cultural.Here additionally there's no organized sector for disposing e-waste .Although there are a unit non-public unorganised peddlers who agency create cash by collection and transporting e-plastic waste to cities like Delhi, Chennai, Mumbai, it's just some half, remainder of it stays in town unprocessed .Recycling of e-waste includes disassembling and destroying the individual components to retrieve many materials[1]. it's been rumoured that ninety fifth of a computer's helpful materials and forty fifth of a ray tubes materials is retrieved through utilisation[2]. A Survey report applied by MPPCB that around 425 MT waste is generated in Bhopal solely by unauthorised dealer and 11.3MT is collected by authorised dealer.

III. SCOPE OF WORK

The main objective of this investigation is to check/calculate the suitability of plastic waste and coconut shells as a rough combination in concrete. This investigation target to figure out the optimum proportion of these wastes as a partial replacement of coarse combination in concrete. Researchers operating with the electronic plastics provide chain have known over thirty merchandise that square measure currently thought-about achievable finish markets for e-plastics wastes. These embody elements and merchandise in market sectors like, control telecommunications, automotive, electrical, construction, shipping, computers, and house appliances. Recent studies have shown that utilise of terribly finely grounded plastic e-waste in concrete has economical and technical advantage for finding the disposal of enormous quantity of e-waste [3]. The utilization of recycled aggregates saves natural resources and selling areas, and helps to take care of a clean atmosphere [4].

The work targeted upon finding physical properties of chopped e-plastic waste and investigates economical use of this material by checking its suitableness for utilise as coarse mixture replacement. The optimum e- plastic waste content to be intercalary as a partial replacement of coarse mixture was resolute and compressive and split durability of combine expectantly variation (5,10,15.20,25%) of E-waste with standard concrete with and while not addition of 100% flyash were compared.

IV. Methodology

All materials utilized in this study were domestically out there. Cement was utilized in this investigation with the fine mixture of4.75 millimetre most particle diameter. . The sand used for the experimental programme was domestically procured and conformed to Indian Specifications IS: 383 - 1970. In keeping with IS 15658: 2006 normal cement of Grade 53 is employed, that conformist IS 12269.53 grade cement may be a prime complete cement with a remarkably high cs3 (tri calcium providing long-lasting) sturdiness to concrete structures. The physical properties of the cement obtained on conducting acceptable tests as per IS: 269/4831 and also the necessities as per IS 12269. Water utilized in concrete cube is conformist the specification of IS 456: 2000. Slump flow check for every case sample was conjointly done.

V. Experimental Results

Series of test were carried out on material, green & hardened concrete to obtain the workability strength characteristics of Plastic waste and Coconut shells for potential application. The results for material test on, water absorption test, specific gravity test, aggregate crushing value test, aggregate impact value test are given.

A. *Crushing Value Test*

Crushing strength test is performed on coarse aggregate as per IS 2386 part IV–1963and it has been observed that crushing value of Plastic waste is having more resistance to the wear and tear than the natural aggregate.

Aggregate	Crushing Value
Natural Coarse Aggregate	14.50%
Plastic Waste	2.82%
Coconut Shells	7.21%

Table 1: Aggregate Crushing Value

B. *Specific Gravity Test*

Specific gravity of materials is performed as per IS 2386 part III–1963, Specific gravity is the ratio of the density of a substance to the density.

Aggregate	Specific Gravity
Natural Coarse Aggregate	2.65
Natural Fine Aggregate	2.60
Plastic waste	1.10
Coconut Shells	1.70
Cement	3.15

Table 2: Result Specific Gravity Test

C. *Water Absorption*

Water absorption of materials is performed as per IS 2386 part III – 1963, Water absorption is performed on the aggregate and it has find that all aggregate have water absorption of all aggregate is below 5%

Aggregate	Water Absorption%
Natural Coarse Aggregate	0.9
Natural Fine Aggregate	0.3
Plastic waste	0.06
Coconut Shells	4.80%

Table 3: Result of Water Absorption Test

D. *Bulking Of Sand*

Bulking of sand is performed as per IS 2386 part III–1963, and results of bulking of sand is 25.6.

E. *Workability*

To evaluate the workability of the contemporary concrete, slump cone take a look at is performed. Slump cone take a look at is completed as per IS: 1199 – 1959. Once coarse mixture is part replaced by plastic waste and coconut shells and it's been ascertained that once plastic waste content accrued, workability of the concrete conjointly accrued and coconut shells concrete workability decrease by the increasing content of coconut shells.

Percentage Replacement	Plastic Waste Mix	Slump (mm)	Coconut Shells Mix	Slump (mm)
0%	CC	75	CC	75
10%	A1	81	B1	68
20%	A2	85	B2	65
30%	A3	92	B3	60
40%	A4	100	B4	55
50%	A5	110	B5	51

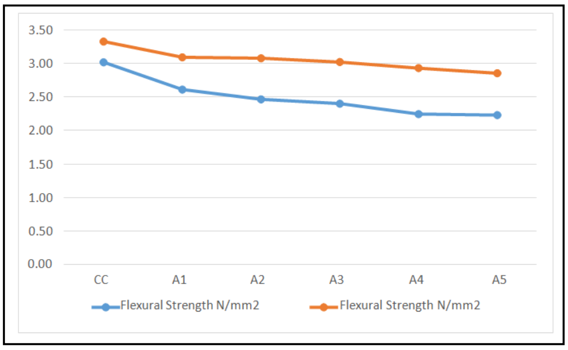
Table 4: Workability of Plastic waste and Coconut shells Concrete

F. *Flexural Strength Test*

Flexural strength check is performed on concrete as per IS: 516 – 1959, for this check concrete beam of 15* 15 * 70 cm is casted. For all eleven combine total 66 beam is casted and it's tested once seven and 28 days of hardening. results of flexural strength of plastic waste and coconut shells is given in table 5 and table 6 beside graph 1 and 2 severally. it's been determined that plastic waste and coconut shells offers most price of flexural strength at 100 percent combine, however none of the plastic waste and coconut shells combine possess higher price of flexural strength than management concrete. Flexural strength of the plastic waste varies from 3.09 to 2.86 N/mm2 and flexural strength of Coconut shells varies from 3.21 to 3.01 whereas flexural strength of management concrete is 3.33.

Plastic Waste	Mix	Flexural strength	
		7 days	28days
0%	CC	3.09	3.33
10%	A1	2.75	3.09
20%	A2	2.47	3.08
30%	A3	2.40	3.02
40%	A4	2.25	2.93
50%	A5	2.23	2.86

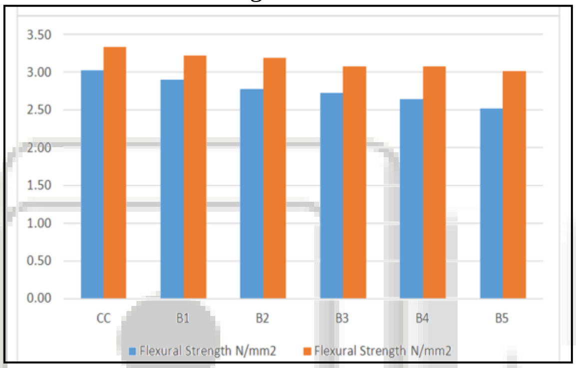
Table 5: Flexural Strength test result of Plastic Waste



Graph 1: Flexural Strength test result of Plastic Waste

Coconut Shells	Mix	Flexural Strength N/mm2	
		7days	28days
0%	CC	3.02	3.33
10%	B1	2.89	3.21
20%	B2	2.77	3.19
30%	B3	2.72	3.08
40%	B4	2.63	3.08
50%	B5	2.52	3.01

Table 6: Flexural Strength test result of coconut shell



Graph 2: Flexural Strength test result of coconut shell

VI. CONCLUSION

This study is carried out so that the reutilisation of waste such as plastic waste (e-waste) and coconut shell (palm family) in combination with concrete. In form of coarse aggregates, workability of concrete is measured by slump cone test. The workability is increased by adding plastic waste but decreased in addition of coconut shell. Compressive strength of concrete decreases with increases in the percentage of plastic waste in concrete.The best way to manage increasing amount of e-plastic waste is integration of multiple options for handling plastics from end-of-life electronics. This approach includes varying combinations of mechanical recycling, feedstock (or chemical) recycling, reuse, energy recovery, and when necessary, the safe land filling of plastics. All these options can be viable for managing e-plastic. However, the optimal combination of management options in any particular region depends on the resources, technologies and availability of materials.

The use of e-plastics in concrete is relatively a new development in the world of concrete technology and lot of research is required before this material is actively used in concrete construction. The use of e-plastics in concrete lowered the strength of resultant concrete, therefore, the research must be oriented towards overcoming this drawback in use of e-plastics in concrete.

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