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Experimental Investigation On Sugarcane Bagasse Ash In Concrete By Partial Replacement With Cement

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Abstract: There are lots of environmental impacts of concrete on our ecology. Cement industry creating environmental problem by emission of co_2 during manufacturing of cement.On the other side sugar cane bagasse ash generated in sugar mill creating environmental issue as most of the part is used as land fill.In this work sugarcane bagasse ash which is taken from one of the sugar mill of south Tamilnadu (India) used in M20 grade of concrete by replacing cement 10%,20% and 30% by weight and compare with normal M20 grade of concrete to check the feasibility of sugar cane bagasse ash in concrete.

Keywords: Sugarcane Bagasse Ash, SCBA

INTRODUCTION

Concrete consists of cement, aggregate, water, and eventually, mineral and chemical admixtures. When all these materials are mixed, cement particles upon contact with water undergo a hardening reaction that bonds the aggregate together. Concrete is the world's most consumed construction material because it combines good mechanical and durability properties, place ability, work ability and it is relatively in the expensive .however, cement production in vaives' significant CO2 emission, which is known as the green house gas mostly important for the global warming. cement which is one of the components of concrete plays a great role, but is the most expensive ant environmentally unfriendly materily each tonne of cement produces approximately one tonne of CO2 an the cement industry is responsible for about 5% of global an thropogenic CO2 emissions. As we know that the cemcnt production gives rise to co2 emissions generated by the calcinations of caco3 and by the combustion of fossil fuels, being responsible for about 5% of the global CO2emissions these emissions can be substantially reduced if 20 to 30% of bagasse ash is replaced in concrete industry. As this sugarcane bagasse ash is obtained in abundance from the various sugarcane factories of Tamilnadu,this paper is dealt with a utillisation of the bagasse ash as by partial replacing cement in concrete industry.therfore ,the main objective of this study is to determine compressive strength and tensile strength of concrete mixed with determine the economic benefit by using the bagasse ash as partial replacement of cement. Further to determine the environmental contribution in mitigating impact brought by the bagasse ash.

Sugar cane Bagasse and Bagasse fly ash

OBJECTIVE

The main objective of this research was to determine the effectiveness of sugarcane bagasse ash (SCBA) as a cement replacement material in concrete.

METHODOLOGY

The material used in the investigation are:

Cement: The most commonly used cement in concrete is ordinary portland cement 53 grade conforming IS 10262-1987

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Fine aggregate: Locally available free of debris and nearly rever bed and sand is used as fine aggregate.The sand particles suit also back to give minimum void ratio, higher voids content leads to requirement of more mixing water.In the present study the sand confirms to zone 1 as per indian standards. (IS :10262,IS:383).The specific gravity of sand is 2.62.

Coarse aggregate: The crushed aggregate used were 20mm and 10mm nominal maximum size and are tested as per indian standards and result are within the permissible limit.(IS:10262,IS3:83).The specific gravity of coarse aggregate 2.72.

Water: Water available in the college campus confirming to the requirements of water for concreting and curing as per IS:456-2009

Sugarcane bagasse ash: The sugarcane bagasse ash consists of approximately 50% of cellulose, 25% of hemicellulose and 25% of lignin.Each ton of sugarcane generates approximately 26% of bagasse (at a moisture content of 50%) and 0.62% of residual ash.The residue after combustion presents a chemical composition dominates by silican di oxide (sio_2). In spite of being a material of hard degradation and that presents few material, the ash is used on the forms as fertilizer in the sugar cane harvests.In this experimental study sugar cane bagasse ash was collected from the srivilliputur factory(tamil nadu).

Chemical analysis of sugar cane bagasse ash :

Chemical compound	Abbreviation	%
Silica	Sio_2	68.42
Aluminium oxide	Al_2O_3	5.812
Ferric oxide	Fe_2O_3	0.218
Calcium oxide	CaO	2.56
Phosphorous oxide	P_2O_3	1.28
Magnesium oxide	MgO	0.572
Sulphide oxide	So_3	4.33
Loss on ignition	LOI	15.90

Chemical compound	Abbreviation	Mg/kg
Sodium oxide	Na_2O	1621
Potassium oxide	K_2O	9406
Manganese oxide	MnO	244
Titanium oxide	Tio_2	240
Barium oxide	BaO	23.73

EXPERIMENTAL WORK

Sugarcane bagasse ash preparation:
Before the use of bagasse ash it was oven dried at 120^0C to remove the moisture in the ash.After oven dry ash was sieve in the mechanical shivers to separate and unburned particles from mass.Sugar cane bagasse ash passing from 300 microns was used in this experimental work.

Casting of sample:
Preparation of the specimens:For the experimental work concrete cubes of size 150x150mm and cylinder 300x150mm were prepared.The 53 grade OPC was replaced with 0%, 10% ,20% and 30% SCBA.In the present investigation a total of 36 specimens were casted and tested.M20 grade of concrete is adopted throughout the study with w/c ratio of 0.5.

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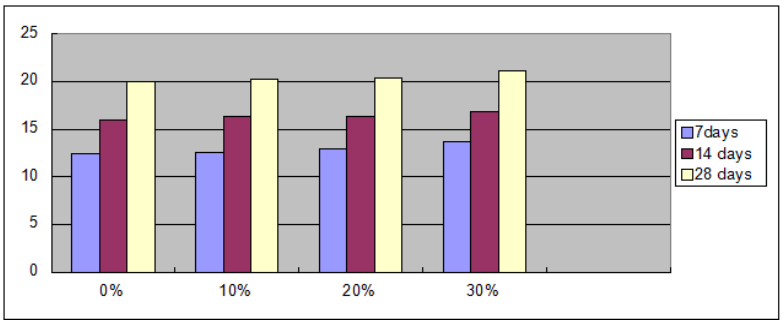
Specimen were tested for compressive strength and tensile strength at on interval of 7th day, 14th day and 28th day of curing in compressive and tensile testing machine.

Following graph represent compressive strength of concrete in which 0%, 10%, 20% and 30% of SCBA replacement with cement.

FOR CUBE:(compressive strngth)

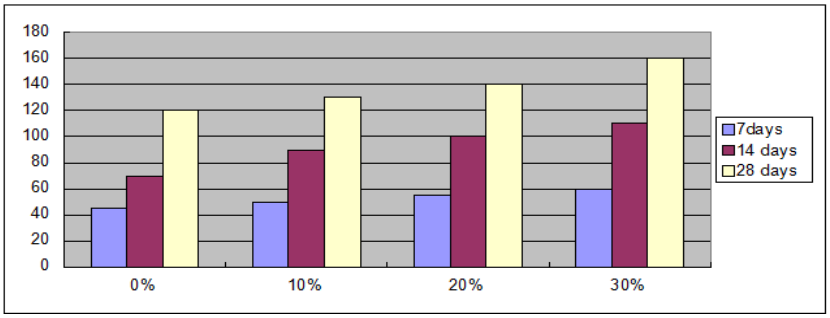
% of SCBA	days	load 1 KN	load 2 KN	comp.str 1 (N/mm²)	comp str 2 (N/mm²)
0%	7	280	280	12.44	12.44
	14	360	390	16	17.33
	28	440	450	19.5	20
10%	7	285	290	12.6	12.88
	14	370	365	16.4	16.2
	28	455	460	20.2	20.4
20%	7	290	300	12.88	13.3
	14	370	380	16.4	16.8
	28	460	470	20.4	20.8
30%	7	310	310	13.7	13.7
	14	380	380	16.8	16.8
	28	475	480	21.1	21.3



Volume of SCBA in %

Specimen were tested for tensile strength at an interval of 7th day , 14th day and 28th day of curing in tensile test machine.

Following graph represent tensile strength of concrete in which 0%, 10%, 20% and 30% of SCBA replacement with concrete.



CONCLUSION

The experimental result shows that the increase in the strength of concrete with the use of sugar cane bagsse ash. Therefore, with the use of sugar cane bagasse ash in partially replacement of cement in concrete, we can increase the strength of concrete with reducing the consumption of cement. Also it is best use of sugarcane bagsee ash instead of land filling and make environmental clean.

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