Utilization Of Sugarcane Baggase Ash And Plastic Aggregate

A review paper

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Abstract :

The waste SCBA (Sugarcane baggase ash) causes a huge disposal problem. Using waste sugarcane baggase ash as a pozzolanic material to replace cement can reduce the consumption of cement and reduce landfill area requirements. This in turn helps to solve environmental issue caused by production of cement, decreasing both energy based and carbon dioxide emissions. Cement production contributes 5% in global warming. It suggested that partial use of SCBA in concrete can improve properties of concrete. In addition of plastic to concrete causes some reduction in mechanical properties such as compressive strength, split tensile strength, flexural strength.

IndexTerms– sugarcane baggase ash, waste plastic

I. INTRODUCTION

Cement concrete is and will remain a major construction material of choice in Civil Engineering construction. Portland cement is the most important constituent of concrete. Unfortunately, cement manufacturing consumes large amount of energy about $7.36x10^{6\ kJ}$ per tons of cement. Also, approximately 1 tons of CO_2 is released into the atmosphere during the production of 1 tons of cement. Thus, partial replacement of Portland cement by mineral byproducts such as fly ash, slag, silica fume can significantly reduce CO_2 emission. Ordinary Portland cement is recognized as a major construction material throughout the world. Researchers all over the world today are focusing on ways of utilizing either industrial or agricultural waste, as a source of raw materials for industry. This waste, utilization would not only be economical, but may also result in foreign exchange earnings and environmental pollution control. Industrial wastes, such as blast furnace slag, fly ash and silica fume are being used as supplementary cement replacement materials. Currently, there has been an attempt to utilize the large amount of SCBA, the residue from an in-line sugar industry and the bagasse-biomass fuel in electric generation industry. A few studies have been carried out on the ashes obtained directly from the industry to study pozzolanic activity and their suitability as binders, partially replacing cement. In civil engineering construction, use of shredded plastics has increased drastically as a partial replacement of aggregates. As it is an added advantage in terms of environmental and potential economic consideration incorporation of waste in concrete increases. Plastic can be incinerated with energy recovery, if material recycling is not feasible. Air pollution may cause and results in acid rain because of waste incineration.The benefits of plastic recycling can be economically advantageous, due to abundant availability lower cost for mixing with other variants like concrete, bitumen etc. The development of concrete with nonconventional aggregate, such as polystyrene foam wastes, HDPE, polyethylene terephthalate (PET), and other plastic materials has been investigated for use in concrete in order to improve the properties of the concrete and reduce cost.

II. OBJECTIVES

- To examine the effect of replacement of cement by SCBA (4%,8%,12%,16%) respectively on the strength of the concrete (M25).
- To examine the effect of replacement of coarse aggregate by plastic aggregate (10%,20%,25%,30%) respectively on the strength of the concrete (M25).
- To find out the optimum percentage of SCBA and plastic aggregate that can effectively replace the cement and the coarse aggregate respectively by weight without any adverse effect on properties of hardened concrete.
- To evaluate the cost variation of conventional concrete and partially replace concrete.

Sugar cane Bagasse and Bagasse fly ash

Fig2.1. Sugar cane Bagasse Ash

Fig.2.2. Plastic Aggregate

III. PROPERTIES

CHEMICAL AND PHYSICAL PROPERTIES OF BAGASSE

Sr. NO	COMPONENT	MASS%
1	SiO_2	78.34
2	Al_2	8.55
3	Fe_2O	3.61
4	CaO	2.15
5	Na_2O	0.12
6	K_2O	3.46
7	MnO	0.13
8	TiO_2	0.50
9	BaO	<0.16
10	P_2O_5	1.07
11	Loss Of Ignition	0.42

Sr. NO	COMPONENT	MASS%
1	Density (g/cm³)	2.52
2	Surface Area (cm²/gm)	5140
3	Particle size (µm)	28.9
4	Color	Reddish grey

Physical Properties Plastic Aggregate

Property	NCA	PCA
Specific Gravity	2.74	0.9
Crushing Value	28	2
Density	3.14	0.81

Fig.3.1. Properties of SCBA and Plastic Aggregate

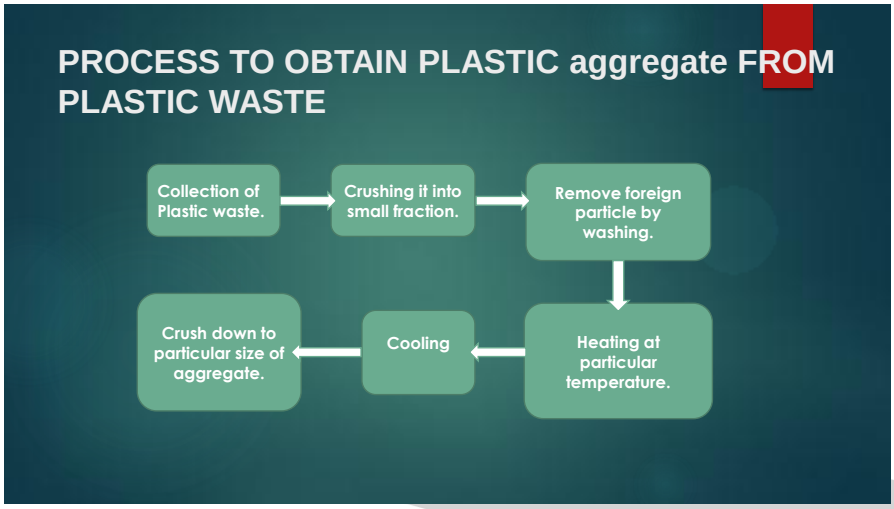


Fig3.2. Process to obtain plastic aggregate from plastic waste

IV. RESULTS AND DISCUSSION

Slump cone test

4.1 Nominal values of slump for different degree of workability

Sr.no.	Slump in mm	Slump in mm	Degree of workability
1	PCC	90	Medium
2	4%SCBA	110	High
3	8%SCBA	135	High
4	12%SCBA	150	High
5	16%SCBA	170	High
6	4%SCBA+10%PA	116	High
7	8%SCBA+20%PA	95	Medium
8	12%SCBA+25%PA	84	Medium
9	16%SCBA+30%PA	70	Medium

4.2 Experimental value of Compression test.

Proportion (%)	Strength at 7 days (N/mm^2)	Strength at 28 days (N/mm^2)
4% (baggase)	14.26	23.72
8% (baggase)	11.15	20.26
12% (baggase)	5.82	13.95
16% (baggase)	4.35	11.12
4+10% (baggase+P.A.)	6.80	14.24
8+20% (baggase+P.A.)	3.55	9.11

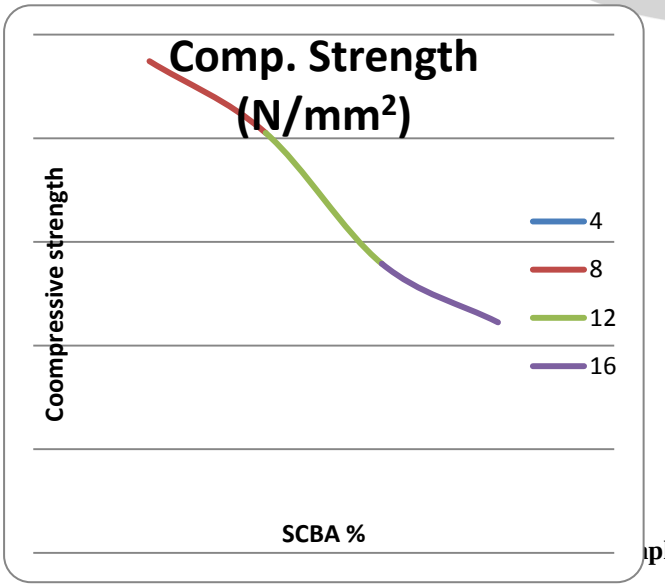
12+25%(baggase+P.A.)	2.35	5.77
16+30%(baggase+P.A.)	1.72	4.56

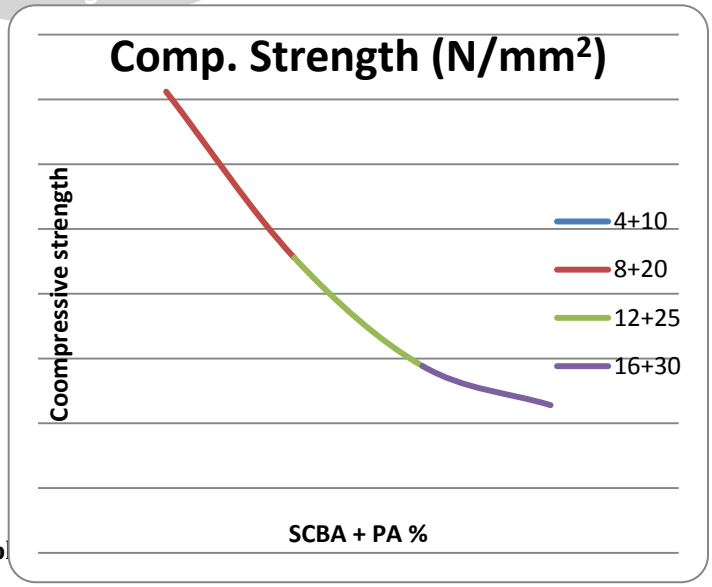
Table 4.3Experimental value for Split tensile test

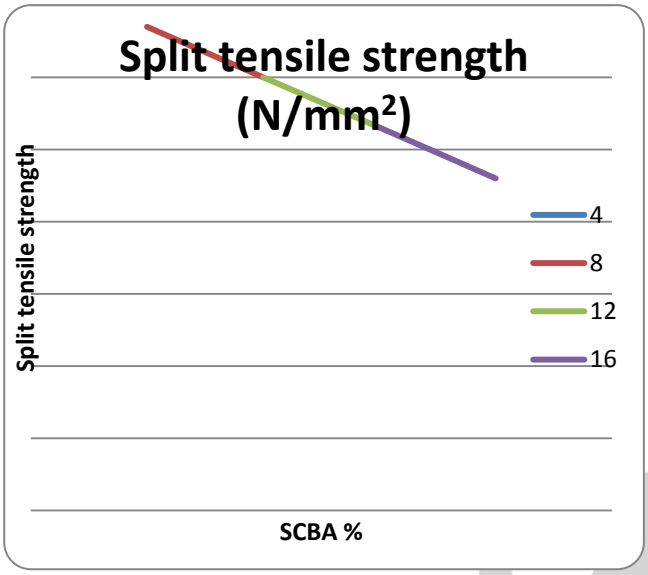
Proportion (%)	Strength at 7 days (N/mm^2)	Strength at 28 days (N/mm^2)
4% (baggase)	0.93	1.34
8% (baggase)	0.71	1.20
12% (baggase)	0.42	1.061
16% (baggase)	0.29	0.92
4+10% (baggase+P.A.)	0.72	1.19
8+20% (baggase+P.A.)	0.43	0.70
12+25%(baggase+P.A.)	0.21	0.49
16+30%(baggase+P.A.)	0.14	0.28

Table 4.4 Experimental value for Flexural test.

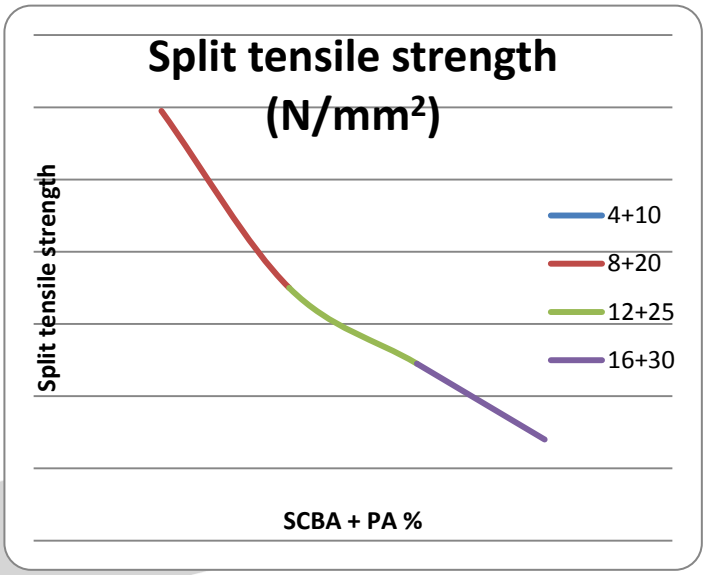
Proportion (%)	Strength at 7 days (N/mm^2)	Strength at 28 days (N/mm^2)
4% (baggase)	7.38	10.38
8% (baggase)	7.028	9.668
12% (baggase)	6.24	8.812
16% (baggase)	5.59	7.812
4+10% (baggase+P.A.)	6.94	9.91
8+20% (baggase+P.A.)	6.71	8.86
12+25%(baggase+P.A.)	5.704	7.568
16+30%(baggase+P.A.)	4.812	6.82



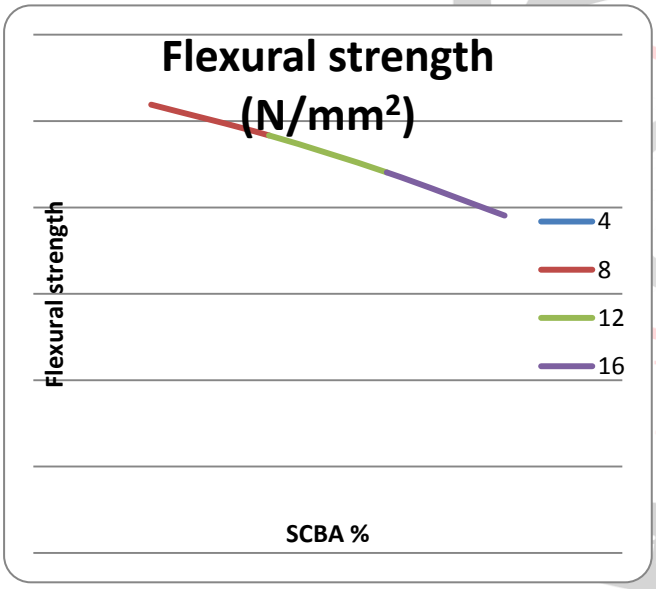




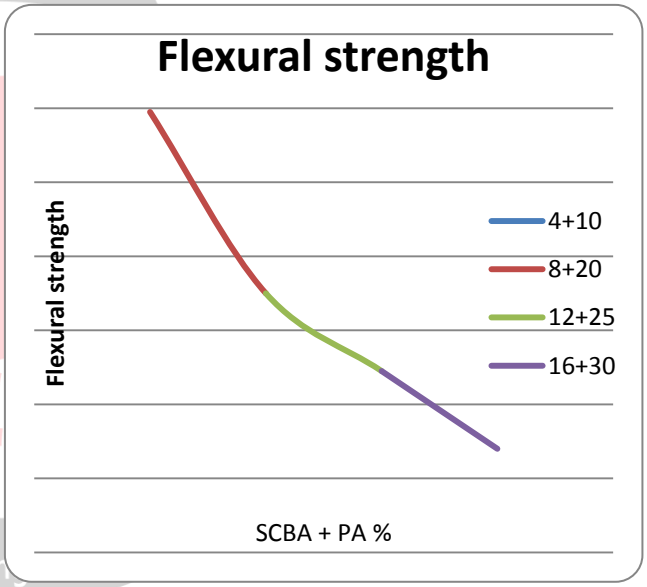
Graph 4.3 SCBA % Vs Split tensile strength



Graph 4.4 SCBA + PA % Vs Split tensile strength



Graph 4.5 SCBA % Vs Flexural strength



Graph 4.6 SCBA + PA % Vs Flexural strength

1. The slump of concrete increases with addition of SCBA.
2. Modified replacement proportion 12% SCBA gives workable concrete and it is good in compression as well as in tension as compare to conventional method.
3. Results shows that with increase percentage of in baggase ash the compressive strength goes on decreasing.
4. As compare to SCBA and PA, when we use only SCBA the results for tests on concrete are better.
5. The cost of cement increases day by day so replacing cement will help to reduce the cost of the construction.
6. The study ensures reusing waste plastic in concrete gives good approach to reduces the cost and solve some of problems posed by plastic.
7. Hence, it is proved that modified replacement proportion SCBA and plastic aggregate is beneficial to use in practice as it gives workable concrete.
8. Future study is needed to increase the strength of concrete by using some other percentages or with other material like super plasticizer etc.

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