

A Case Study on Waste Utilization of sugar cane bagasse ash in Concrete Mix

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ABSTRACT: Concrete is the most widely used construction material today. This paper deals with the utilization of sugar cane bagasse ash in cement concrete. The sugar cane bagasse ash waste product is used as a partial replacement to cement. It deals with M25 grade concrete and the production (extent) to which bagasse ash can be used. For this three trail mixes with varying proportions of sugar cane bagasse ash has been choose and the strength results of cubes after 1 day,7day and 28days cylinders strength after 28 days and the prisms strength after 28 days have been reported and presented graphically. Based on the above mentioned test results, bar charts were drawn and the results are shown graphically and finally conclusions were shown.

Keywords: bagasse ash, concrete mix, workability

1. INTRODUCTION

Every year millions of tons of ash are generated from thermal power plants. In additional to this a larger quantity of agriculture waste like rice husk ash, sugarcane bagasse ash is also produced. The problem gets compounded with million tons of waste being generated worldwide inform of demolished waste from natural and technological disasters. There is a growing concern to limit the amount of waste by recycling which will provide opportunities for saving energy, time and resources.

The utilization of by-products in the production of concrete has gained considerable interest among concrete technologists in the recent years. Minerals admixture like sugar cane bagasse ash is most common type of by-product. That is usually incorporated into concrete mixes to produce concrete with exception properties. The conventional concrete used cement, fine aggregate, course aggregate and water. The cost of the convection materials like cement is increasing spirally hence they can be reduced to sugar cane bagasse ash, which are industrial wastes available at low cost. As not much of literature is available for the aspect of utilization trial and error procedure has been adopted for selection of water cement ratio.

1.1 NEED FOR STUDY:

The present is taken up with an aim to utilize more sugar cane bagasse as replacement in cement. This

procedure users more sugar cane bagasse ash than it is utilized in cement only, as replacement on which aspect maximum literature is available. Hence there is need for this study to find the optimum percentage of sugar cane bagasse ash.

1.2 PRESENT STUDY PERFORMANCE:

Sugar cane bagasse ash in present study is obtained from Samarlakota (A.P) thermal power station. OPC 53 grade (Bharathi) cements fine aggregate conforming to zone-2, course aggregate of 20mm size had been used. The concrete mix corresponding to M25 is chosen for the study. The mix design yielded a proportion of **0.45:1:1.211:2.938**.

There trail mixes with varying proportions of sugar cane bagasse ash had been analysed. The following table describes about the mixes.

Table 1: Mix prepositions

Mix	Constituents
B1	Cement+FA+CA
B2	(0.9% CEMENT=0.1SCBA)+FA+CA
B3	(0.8% CEMENT+0.2SCBA)+FA+CA

FA-Fine Aggregate

SCBA-Sugar cane bagasse ash

CA-course aggregate.

For each mix 8 cubes were casted and three were casted at 1 day (accelerated curing), three cubes at 7 days three cubes at 14 days and three cubes at 28 days. Two cylinders for compressive strength and two for split tensile strength. Prisms are cast for flexural strength. The results were drawn graphically.

2. COMPOSITION OF MIXES

B1 Mix: This mix is a normal mix with only cement, fine aggregate and course aggregate containing sugar cane bagasse ash.

B2 Mix: In this mix cement is replaced by 10% sugarcane bagasse ash. Fine aggregate and course aggregate are considered.

B3 Mix: In this mix cement is replaced by 20% sugar cane bagasse ash, fibre aggregate and coarse aggregate are considered.

2.1 MIXE COMPOSITIONS FROM B1 TO B3:

(a)For mix B1:

0.45:1:1.211:2.938

(b)For Mix B2:

0.45: (0.9% cement+0.1%SCBA):1.211:2.938

(c)For Mix B3:

0.45: (0.8% cement+0.2%SCBA):1.211:2.938

3. RESULTS AND DISCUSSIONS:

The percentage compressive strength of B2 mix with B1 mix for 7 and 28 days are 83.81, 98.39 respectively. Similarly B3 mix with B1 mix for 7 and 28 days are 61.89, 77.60 respectively.

Table 2: Cubes compressive strength

Mix No.	Cubes compressive strength			
	1Day	7Days	14Days	28Days
B ₁	36.90	25.725	29.89	35.36
B ₂	30.94	21.56	26.95	34.79
B ₃	25.93	15.92	20.58	27.44

Table 3: cylinders and prisms strength

Mix No.	Compressive Strength of cylinder 28 days N/mm ²	Split tensile test 28 days N/mm ²	Flexural Strength 28 days N/mm ²
B ₁	30.05	1.98	5.29
B ₂	29.57	1.90	4.69
B ₃	24.69	1.45	3.69

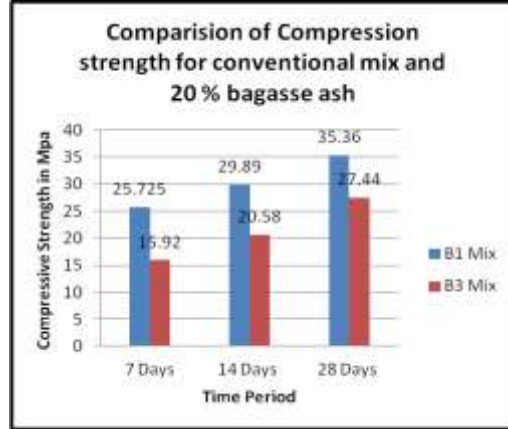


Figure 1: Comparison of compression strength for B1 mix and B3 mix

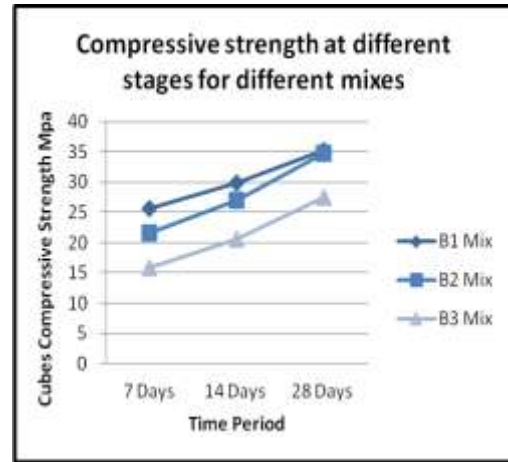


Figure 3: Comparison of compressive strength at different stages for different mixes.

4. Conclusion and scope for further study:

4.1 Conclusion:

From the above investigations, it is observed that structural properties like compressive strength, flexural strength, split tensile strength of concrete with the replacement of cement by sugar cane bagasse ash, which is close to the strength of conventional concrete. Test results indicate that the strength results of conventional mix close to the strength of concrete which is replace by 10% sugar cane bagasse ash in cement. It can be concluded that 10% sugar cane bagasse ash can be replaced in cement which give results equal to the normal concrete. The utilization of by-products in the production of concrete has gained considerable interest among concrete technologists in the recent years. Mineral admixture like sugar cane bagasse ash is the most common type of product. The cost of

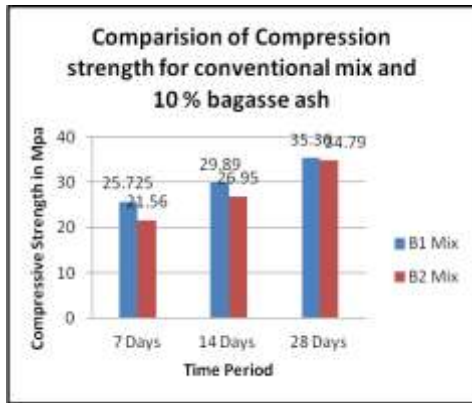


Figure 1: Comparison of compression strength for B1 mix and B2 mix

conventional materials like cement is increasing gradually, by the economical considerations, sugar cane bagasse ash which is industrial wastes available at low cost. A proper mix design and use of plasticizers can further improve the acceptable quantity of cement concrete for construction. When compared to the other waste materials it is very economical.

4.2 Scope for further study:

The concrete properties like compressive strength, flexural strength, split tensile strength are considered and other properties against heat resistance, shear should be studied. It can also be studied in self compaction of concrete. We can replace fly ash in place of sugar cane bagasse ash for the utilization of concrete.

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