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EFFECT OF BAGASSE ASH ON STRENGTH OF CONCRETE

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Abstract*— Cement is the most widely consumable material in the infrastructure development works. It is considered as a durable material of construction. however, the environmental issue of cement has become a rising concern, as cement industries are accountable around 2.5 % of total worldwide waste emissions from industrial sources. It is need of time to rise the use of cement replacement materials in the concrete which can reduce the significant amount of cement required huge energy and it is also accountable for 5% of global anthropogenic carbon dioxide release, and their usage can also improve the properties of concrete. The burning of organic waste of sugar industry known as bagasse ash (SCBA). Bagasse ash is product from burning of sugarcane bagasse and it is made up of silica, alumina, iron, and calcium. pozzolanic ash has been used for 1000's of years. SCBA is freshly acknowledged as a pozzolanic material, though, there is partial research statistics accessible to the effects of SCBA on the behaviour of concrete.
The main objective of project is replacement of cement with sugarcane Bagasse ash in fixed proportions and analysing the effect of strength in the concrete. Bagasse ash has been chemically and physically characterized, and replaced the cement partially in the ratio of 0%, 5%, 10%, 15% and 20% by weight in concrete. Concrete of grade M20 was considered and control mix designed using IS 10262-2009. The cubes are been casted and cured in normal water for ages of 7 and 28 days. The properties like compressive strength for hardened concrete are verified and results are analysed.

Keywords*— SCBA(sugarcane bagasse ash)

I. INTRODUCTION

Concrete is prepared by mixing various constituents like cement, water and aggregate etc. which are economically available. Concrete is second most highly used item in the world after water. the production of cement used in concrete involve emission of large amount of carbon dioxide which is major responsible agent for green house and global warming effect. So, this leads to the ecological imbalance and cause pollution. Environmental restriction of cement used in concrete have resulted in search for alternative which can be used in place of cement in concrete. Nowadays, SCBA is successfully used in concrete as a cement replacement which are cement saving, energy saving and cost saving and moreover cause environmentally and socio-economic benefits.
This paper analyzes the effect of SCBA in concrete by partial replacement of cement at the ratio of 0%, 5%, 10%, 15% and 20% by weight. The experimental study examines the compressive strength of concrete. The main ingredients consist of Portland cement, SCBA, sand, coarse aggregate and water. After mixing, concrete specimens were casted and all specimens were cured and tested in water at 7 and 28 Days.

II. OBJECTIVES

1. To make the concrete in the most economical manner.
2. To achieve relatively higher strength and good workability.
3. To use waste residual material from sugarcane factory.
4. To reduce environmental pollution due to cement producing industry.

III. METHODOLOGY

this experimental program was designed to compare the mechanical properties example, compressive strength and split tensile strength of concrete M20 grade of concrete with different replacement levels of ordinary Portland cement with SCBA 0%, 5%, 10%, 15% and 20% As per IS 10262:2009 the mix proportion is 0.58:1:2.15:4.23 and with water cement ratio maintained 0.58.

1. Mixing of ingredients:
Firstly the sand and coarse aggregate are weighted with their relative proportions and placed in mixing drum. Weighted quantity of cement is then added to sand and coarse aggregate. Dry mixing is carried out measured quantity of water is added to dry mix.

2. Adding bagasse ash:
The specimens are casted for 0%,5%,10% and 20% of bagasse ash by weight of cement. Bagasse ash is mixed during dry mixing.

3. slump test:
To measure workability of concrete, slump test is carried out in laboratory. The standard mould filled in three layer which has tamped by 25 blows of tamping rod having bullet point.

compaction:
The specimens are casted firstly by hand mixing and then by table vibrator.

5. De-shuttering:
De-shuttering of casted specimen are done in between 12 to 36 hours.

6. Curing:
After de-shuttering the specimen curing is carried out by conventional method such as immersion curing in water tank as well as by accelerated curing
7. Testing:
Various tests like specific gravity, water absorption, sieve analysis etc. were carried out as per IS standards

IV. **TESTING**

1. Compressive strength test:

The results of compressive tests are represented in table no 1. The compressive strength of concrete increases with SCBA content. The maximum increase in compressive strength was observed at 5%, and comes to normal strength when mixed with 10%.
The significantly increased the compressive strength of concretes at the ages of 7 and 28 days, as evident from Table. The improvement of compressive strength is mostly due to the micro filling ability and pozzolanic activity of SCBA. With a smaller particle size, the SCBA can fill the micro-voids within the cement particles. Also, the SCBA readily reacts with water and calcium hydroxide, a by-product of cement hydration and produces additional calcium silicate hydrate or CSH. The additional CSH increases the compressive strength of concrete since it is a major strength-contributing compound. Also, the additional CSH reduces the porosity of concrete by filling the capillary pores, and thus improves the microstructure of concrete in bulk paste matrix and transition zone leading to increased compressive strength.

Table no.1 % increase in compressive strength

SCBA Content in %	Compressive strength in (Mpa)		% increase in compressive Strength	
	7 Days	28 Days	7 Days	28 Days
0	19.43	29.09	-	-
5	23.10	34.47	18.89	18.50
10	19.28	29.09	-0.77	0
15	16.04	26.44	-17.60	-9.11
20	15.10	24.90	-22.28	-14.40

2. Split tensile test:

Result from table no 2 shows that cylinder split tensile strength of concrete increases considerably with increase in SCBA content. The maximum increase in tensile strength was observed at 5%, and comes to normal strength when mixed with 10%.

Table no. 2 %increase in tensile strength

SCBA Content in %	Tensile strength in(Mpa)		% increase in tensile Strength	
	7 Days	28 Days	7 Days	28 Days
0	1.6	3.99	-	-
5	2.81	4.33	75.62	8.52
10	2.18	3.57	36.25	-10.52
15	1.84	2.85	15	-28.57
20	1.46	2.27	-8.75	-43.10

V. COST ANALYSIS

Density of materials:

Coarse aggregate- 3010Kg/cu.m

Fine aggregate - 2890 Kg/ cu.m

Bagasse ash -1800 Kg/ cu.m

Cement - 3150 kg/ cu.m

Rates of materials:

Cement -275 Rs./ bag

Sand - 5500 Rs. / brass or 1943.46 Rs. / cu.m

Aggregate -3000 Rs./ brass or 1060.07 Rs. / cu.m

Fly ash – 2000 Rs. / brass or 706.71 Rs. / cu.m

Table no.3 Cost without replacement of cement

Materials	Quantity (in bags)	Quantity (m^3)	Rate per Quantity	Cost (Rs.)
Cement	6.4		275	1763.56
Fine Aggregate		0.24	1943.46	466.43
Coarse Aggregate		0.45	1060.07	477.03
			Total	2707.02

Table no.4 Cost with 5 % replacement of cement

Materials	Quantity (in bags)	Quantity (m^3)	Rate per Quantity	Cost (Rs.)
Cement	6.1		275	1677.5
Fine Aggregate		0.24	1943.46	466.43
Coarse Aggregate		0.45	1060.07	477.03
SCBA	16.03 Kg.	0.01	706.71	7.07
			Total	2628.09

Table no.5 Cost with 10 % replacement of cement

Materials	Quantity (in bags)	Quantity (m^3)	Rate per Quantity	Cost (Rs.)
Cement	5.77		275	1677.5
Fine Aggregate		0.24	1943.46	466.43
Coarse Aggregate		0.45	1060.07	477.03
SCBA	32.06 Kg.	0.02	706.71	14.33
			Total	2544.86

Reduction in cost:

For 5 %
2707.02-2628.09 = 78.93
Percentage reduction = 78.93 / 2707.02 x 100 = 2.91 %

For 10 %
2707.02-2544.86 = 162.16
Percentage reduction = 162.16 / 2707.02 x 100 = 5.99 %

It is economical to use SCBA for replacement of cement. For same strength parameter 6 % economy is achieved in material costing

VI. CONCLUSION

1. The increase in compressive strength is directly proportional to the SCBA content the compressive strength of concrete is found to increase up to the maximum of 34.47 MPa at 5% SCBA.
2. Split tensile strength of concrete is found to increase with increase in SCBA content. The maximum increase up to 4.33MPa is obtained at 5% of SCBA content.
3. The results show that the SCBA concrete had significantly higher compressive strength compare to that of the concrete without SCBA. It is found that the cement could be advantageously replaced with SCBA up to maximum limit of 10%. Although, the optimal level of SCBA content was achieved with 5% replacement.
4. Partial replacement of cement by SCBA increases workability of fresh concrete; therefore use of superplasticizer is not substantial.
5. Since, bagasse ash is waste material, its use as a cement replacing material reduces the level of carbon dioxide emission by cement industry and also saves a great deal of virgin materials.
6. It was clearly shown that SCBA is a pozzolanic material that has the potential to be used as partial cement replacement material and can contribute to the environmental sustainability.
7. It is economical to use SCBA for replacement of cement. For same strength parameter 6 % economy is achieved in material costing.

REFERENCES

[1] IS 3812:2003 pulverized fuel ash — specification**, part 1-** for use as pozzolana in cement, cement mortar and concrete. **(1)**

[2] IS 12269 : 2013 ordinary portland cement, 53 grade — specification. **(2)**

[3] IS 383 -1970 "*Specifications for Coarse and Fine Aggregates from Natural Sources for Concrete*", Bureau of Indian Standards, New Delhi. **(3)**

[4] IS 10262: 2009, "*Indian Standard, recommended guidelines for concrete mix designs",* Bureau of Indian Standard, New Delhi **(4)**

[5] IS 456: 2000, "*Indian Standard, Plane and reinforced concrete- Code of practice*", Bureau of Indian Standard, New Delhi, 2000. **(5)**

[6] IS 9013:1978 "*Indian Standard METHOD OF MAKING, CURING AND DETERMINING COMPRESSIVE STRENGTH OF ACCELERATED-CURED CONCRETE TEST SPECIMENS"*[(6)]

[7]IS 516:1959, "*Method of Tests for Strength of concrete*", Bureau of Indian Standard, New Delhi. **(7)**