International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 7 Issue 01, January-2018

Review on Effect of Baggase ash on Strength of Concrete

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Abstract: **Nowadays the main focus of research is to reduce the industrial and agricultural waste for eco friendly environment. Sugar-cane bagasse ash (SCBA) is a fibrous waste product obtained from sugarcane industry. After extracting juice from the sugarcane, the remaining of sugarcane known as bagasse is burnt at high temperature in uncontrolled condition to produce the ash. This waste product is already causing serious environmental pollution. In the present study the effect of bagasse ash on the strength of concrete is investigated. The addition of bagasse ash not only helps in reducing pollution but also leads to sustainable development of the country. From the literature it has been observed that bagasse ash significantly increases the strength of concrete and it can be used as a partial replacement of cement in the concrete.**

Keywords: Sugarcane Bagasse ash (SCBA), concrete, Sustainable development, eco friendly environment

I. INTRODUCTION

As the population of the nation is increasing, the industrialization and pollution level is also increasing. Therefore it is our foremost duty to reduce the pollution and make the planet healthy for living. Air pollution is not only caused due to release of toxic gases from the factories but also due to minute particulate materials (fly ash) which are produced because of burning of coal and other materials. The production of sugar and jaggries released huge amount of bagase ash. In India there are about 443 operating sugar mills where after extracting juice from sugar cane the remained part (bagasse) is further used as fuel to heat the boilers. The incineration of bagasse produces the ash. Bagasse has a various use in market as such in production of woods, animal foods and thermal expansion e.t.c then also a lot of bagasse remains unused and they get dumped as landfill. The government is more concerned in utilizing the flyash. The ministry of Environment directs the industries to extract the fly ash and reuse it in production of cement, tiles and bricks etc. Since our nation is a developing, so requirement of infrastructure is more, for more infrastructure cement requirement is also very high. The production of cement produces harmful gases like CO_2 which degrades the environment causing health issues to the residents. With the advancement in the technology new methods have been adopted to reduce the consumption of cement. One such method is addition of bagasse ash to concrete. Sugarcane ash is an industrial waste product which contains aluminium ion and silica, which is pozzolanic in nature. For natural pozzolans the minimum silica, aluminium and iron oxide content is 70 % and SiO_3 should be less than 4 %. The researchers have found that bagasse fulfill these requirement. Thus ash behaves as a pozzolanic material. In Bagasse there is 50% cellulose, 25%of hemiecllulose and 25% of lignin. It has been observed that approximately 26% of bagasse and 0.62% of residual ash are produced from 1 ton of sugarcane. Use of ash in concrete reduces the cement requirement and also reduces the cost of construction. Researchers also suggest that the baggasse fly ash can be successfully used in producing bricks, tiles, stabilizing the soil etc.

II. LITERATURE REVIEW

(i) R Srinivasan and K. Sathiya had concluded that blended SCBA in concrete had higher compressive strength, tensile strength and flexural strength in comparison to that of without SCBA .They came to a conclusion that cement can be partially replaced by SCBA upto a extent of 10%.They even concluded that with addition of more SCBA the density of concrete will decrease and low weight concrete will get produced.

(ii) Mrs.U.R.Kawade et al observed that cement can be successfully replaced with SCBA upto an extent of 15%.The partial replacement of SCBA increases the workability of concrete due to which super plasticizer is not required.

(ii) Noor-Ul Amin had concluded in the research that upto 20% of high strength portland cement can be partially replaced with SCBA without any altered effect on the properties of concrete. Addition of SCBA will leads to high early strength, reduction in permeability and resistance to chloride permeation and diffusion.

(iii) S Aishwarya, et al found that when concrete was mixed with partial 10% of SCBA then the compressive strength increased 1.21 times and tensile strength increased 1.04 times. With addition of SCBA to concrete, members shows a better durability as they are less permeable to chloride ions

(iv) Lathamaheswari, et al observed in their research that the workability of concrete has not been very much affected by increment in replacement of cement with SCBA and cement

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would be replaced with SCBA upto a maximum limit of 10% .When cement was partially replaced by SCBA in concrete, it had also shown a good modulus of elasticity.

(v) Bangar Sayali S. et al concluded that with partial replacement of cement in concrete with SCBA strength of concrete can be increased with reduction in use of cement. They even concluded that Bagasse Ash best use is with addition in cement rather than land filling.

(vi) Prashant & M R Vyawahare from their research found that the as the percentage of bagasse ash increases sorptivity coefficient also increases. The porous nature of SCBA and the impurities present in it makes the concrete permeable concrete. They concluded that if bagasse is used in its purest form than it can prove to be better replacement of cement.

(vii) E. V. Morales et al gives the information about the chemical composition of baggas ash. They told that ash contain silica, aluminum and iron oxide as as major component. Among these three components silica content is much higher than other and helps in pozolanic reactions. Calcination temperature of bagasse ash plays a vital role in obtaining higher pozolanic reaction.

(viii) Cordeiro et al. suggested that 600°C for three continuous hours is the optimal temperature and time to obtain bagasse ash having high pozzolanic activity.

III MATERIAL USED FOR CONCRETE MIX WITH BAGASSE ASH

Cement: Ordinary Portland cement (OPC) of grade 53 is generally adopted for making concrete. It should fulfill the requirement of IS Code.

Table1: Properties of cement

S.No.	Physical Requirements	I.S 12269- 1987
1.	Initial Setting time	>30min
2.	Final Setting time	<600 min
3.	Specific Surface area m ^{2}/kg	>225
4.	Soundness by Le Chatelier's mm	<10
5.	Compressive strength MPa	
	3 days	>33
	7 days	>43
	28 days	>53

Fine aggregate: Locally available sand free from Debris is used as Fine aggregate. The sand particles are packed to give minimum void ratio. The sand particles should range between 4.75mm to 150micron.

Coarse aggregate: The crushed aggregates range between 10 and 20mm nominal size.

Water: Water plays an important in concrete as it hydrates the cement and helps in getting desired strength. Reaction of cement and water produces C-S-H gel, which is responsible for strength. The strength of cement is gained due to binding action of C-H-S gel. Therefore to gain required strength water has a crucial role to play. The water available in the nearby areas conforming to the requirements as per IS: 456-2009 can be used in to prepare concrete mix.

Sugarcane Bagasse Ash: Bagasse ash is obtained from the sugarcane industry.

Table2: Chemical composition of bagasse ash

S.No.	Component
1	SiO_2
2	Al_2O_3
3	Fe_2O_3
4	CaO
5	Na_2O
6	K_2O_3
7	MnO
8	TiO_2
9	P_2O_5

The bagasse ash collected from different sources or parts of India contain Silica and alumina as main ingredients. The combination of silica, alumina and iron oxide is more than 70 % in SCBA. This the reason ash acts as pozolanic material.

The mix design of concrete with bagasse is prepared according to the strength required as per IS code 10262-1981 & IS: 456-2009.

IV EXPERIMENTAL WORK

Firstly the sieve analysis of 10 mm and 20mm coarse aggregates is done as per IS procedure.

Then concrete mix is prepared as per the required strength and by replacing cement by bagasse ash. After that the slump cone test has to be carried out for checking the workability of the concrete mix. Workability of concrete is the ease with which concrete can be handled from mixing to

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final compacted shape. Workability require for roof work is different from the workability required for mass concreting. Different work required different workability. Sometimes to enhance the workability of mixture super plasticizers are also added.

To find the efficiency of bagasse fly ash in concrete, numbers of cubes of size 150 mmX150mmX150mm are to be casted and kept them for curing in a water tank. After curing their compressive strength, flexural strength and tensile strength at 3 days, 7 days, 21 days& 28 days are obtained. Different cubes are prepared by replacing cement by 0% to 25% of SCBA. To obtain the optimum bagasse ash content in a concrete mix various percentage of ash has to be added in concrete mix and then their strength should be computed. The percentage of ash where we are getting higher compressive strength value is to be used for mix design.

V. CONCLUSION

From the literature it is concluded that 10% to 20% cement can be partially replaced by SCBA for higher compressive strength, flexural strength and tensile strength. By addition of SCBA concrete had become more durable and requirement of super plasticizer is not needed. SCBA concrete mixture show good modulus of elasticity.

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