International Journal of Engineering Research-Online
A Peer Reviewed International Journal
Email:editorijoer@gmail.com http://www.ijoer.in

Vol.4., Issue.3., 2016
(May-June)

RESEARCH ARTICLE

ISSN: 2321-7758

GREEN CONCRETE: PARTIAL REPLACEMENT OF CEMENT WITH BAGASSE ASH

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ABSTRACT

Concrete is an absolutely essential and widely used construction materials all over the world for development infrastructure. But the increase in cost of cement and scarcity in river sand not only increase the budget of a building but also poses a serious threat to the country's development. Despite its versatility in construction, it is known to have several limitations. It is weak in tension, has limited ductility and little resistance to cracking. The entire construction industry is in search of suitable and effective alternative SCM Of late ,it is identified that some industrial waste products like Rise Husk ash, Fly ash, Bagasse ash, silica fume etc. are having some cementitious and siliceous properties which is advantageous to increases properties of concrete as well as effective in reducing the cost of construction.

Keywords:Pozzolanic material, Bagasse ash,SBAConcrete.

I. INTRODUCTION

Concrete is one of the widely used construction material all over the world because of longer service life and cost effectiveness. But according to pollution point of view during manufacturing process of cement tremendous amount of CO2 is liberated in the environment. The alternative way to reduce pollution of environment is using some additive (SCM) in concrete or A good solution for the problem of recycling

Agro industrial residues would be to burn them in a controlled environment, and use the ashes for more noble means [1,10]. Sugarcane is major crop grown in over 110 countries and its total production is over 1500 million tons. Sugarcane production in India is over 300 million tonnes per year [10,8]. Sugar-cane bagasse is a fibrous waste-product of the sugar refining industry, along with ethanol vapor[2]In India the major sources of different types of wastes are Sugar industry, Distillery, Textile industry ,Paper industry. Above maintained industries produces large amount of solid waste .Sugar industry is the major industry which produces large amount of solid waste in fact it is the largest sector in Indian economy. Even it is the value added industry, it has several environmental impacts causing land and water pollution during disposal. Solid waste management and disposal is one of the major problem nowadays. Many study has conducted on minimizing of pollution level due to dumping of bagasse ash in premises. In this study an attempt has made to utilize sugar cane bagasse ash as a construction material as a supplementary cementations material (SCM).It is observed that a wide variety of residues are being used in the construction industry asmineral additives such as sugarcane bagasse ashsugarcane chaff ash, swine waste ash andash from swine bedding with a base of rice shells [1]. A few studies havebeen carried out on the ashes obtained directly from the industries to study pozzolanic activity and their suitability as binders, partially replacing cement.Therefore it is possible to use sugarcane bagasse ash (SBA) as cement replacement material to improve quality

and reduce the cost of construction materials such as mortar, concrete pavers, concrete roof tiles and soilcement interlocking block[2].When used as replacement for cement in concrete, it reduces the problem associated with their clearance[10].The sugarcane bagasse ash consists of approximately 50% of cellulose, 25% of hemicelluloses and 25% of lignin [8]. Review says thatit has high silica content: 87% (Cement's silica content: 22%). specific gravity: 1.80 to 2.16 (Cement's specific gravity: 3.15). it is also observed that presence of oxides and carbon in the ash will make it suitable for refectory and ceramic products such as insulation, membrane filters and structural ceramics. Also bagasse ash can be used as facing sand moulding during casting operations [3].In Sugar cane industry bagasse ash is a residue resulting from the burning of sugar cane in boilers for power generation. A limited amount of bagasse ash has been used as soil amendment while the rest of ash is useless causing serious environmental impacts. It has a very high silica concentration and contains aluminum, iron, alkalis and alkaline earth oxides in small amount. The main composition of bagasse ash is siliceous oxide (SiO) that reacts with free lime from cement hydration. But only un-crystal silica oxide has reactive properties. Therefore for determining the amorphous, the specimens were burned at different temperature and duration. The bagasse is used to improve the quality and reduce the cost of construction materials. It is valuable pozzolonic [SCM] material and its cost is similar to fly ash. It reduces negative environmental effect and landfill volume.

TABLE 1. Comparison of Chemical composition of Portland cement, Slag , Silica fume, Fly ash, RHA and SBA

Compound (%)	PC	Slag	Silica Fume	Fly Ash	RHA	SBA
CaO	60-67	30-46	0.1-0.6	2.0-7.0	0.55	3.91
SiO_2	17-25	30-40	85-98	40-55	93.81	70.7
Al_2O_3	3.0-8.0	10-20	0.2-0.6	20-30	1.1	6.59
Fe_2O_3	0.5-6.0	4.0	0.3-1.0	5.0-10	0.19	1.03
MgO	0.1-4.0	2.0-16	0.3-3.5	1.0-4.0	0.4	2.87
SO_3	1.0-3.0	3	-	0.4-2.0	-	-
Na_2O	-	3	0.8-1.8	1.0-2.0	0.23	-
K_2O	-	3	1.5-3.5	1.0-5.0	0.017	-

II. SUGAR CANE BAGASSE ASH CONCRETE

The concrete is prepared by adding [SCM] sugar cane bagasse ash in concrete. In this technique Concrete is prepared by Replacing Cement in some percentage with Sugar cane bagasse ash.SBAC improves the strength of cement sand mortar, Durability, Permeability and minimization of crack on surfaces of concrete structures. The sugarcane bagasse ash consists of approximately 50% of cellulose, 25% of hemicelluloses and 25% of lignin Each ton of sugarcane produces approximately 26% of bagasse and 0.62% of residual ash. The residue after combustion presents a chemical composition dominates by silicon dioxide (SiO2)[7]. Bagasse ash has been chemically and physically characterized, and partially replaced in the ratio of 0%, 5%, 10%, 15%, 20% and 25% by weight of cement in concrete [2,7]and compressive strength, split tensile strength, flexural strength and modulus of elasticity at the age of 7 and 28 days was obtained. The bagasse ash was then ground until the particles passing the 90 µm sieve size reach about 85% and the specific surface area about 4716 cm^2/gm[4,6]. The result shows that the strength of concrete increased as percentage of bagasse ash replacement increased. It is found that the cement could be advantageously replaced with SBA up to maximum limit of 10%. Compressive strength, tensile strength and flexure can be increased with 10% replacement of SBA at 28 days

[10]. Most of the studies based on SBA as a supplementary cementitious material were carried out to evaluate compressive strength[1,4,7,10] tensile strength and flexural strength of mortars and concretes [2,8,11]. Some of author also taken X-ray diffraction test on SBA paste [8].

There are various types of Ash's which are used for making concrete and help to improve the concrete strength and durability at some extent and also reduces the cost of construction. According to literature review, following are the some of the SCM [2,8] used in the concrete.

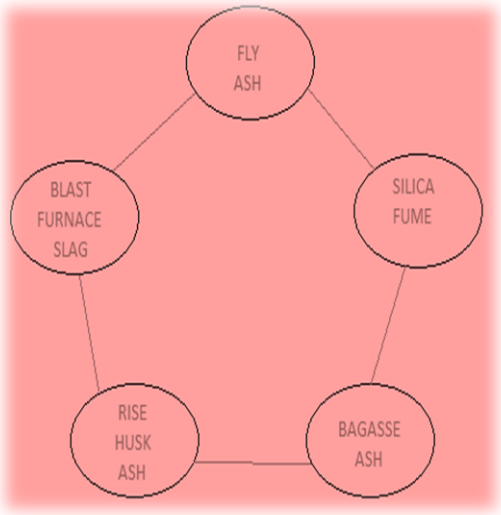

Fig. 1. Various types of SCM used in concrete

PHOTO1.Sugar cane bagasse

According to literature survey there are some advantages of bagasse ash as bellow

A. ADVANTAGES OF BAGASSE ASH

- Economical construction.
- SBA increases workability of fresh concrete, therefore use of super plasticizer is not substantial.
- Density of concrete decreases with increase in SBA content.
- Bagasse ash is very light material dead load of construction is decreased.
- Bagasse ash can be used as a farm fertilizer.
- Bagasse ash is also suitable for making ceramic products.
- Increases workability of fresh concrete.
- Compressive strength, tensile strength and flexure can be increased with 10% replacement of SCBA at 28 days.

III. FUTURE POTENTIAL AND CHALLENGES AHEAD

Concrete is a porous material and the ingress of water, oxygen, and aggressive ions, such as chlorides, can cause the passive layer on reinforced steel to break down. Additives, such as fly ash, micro silica, rice husk ash, and sugar cane bagasse ash, have a size breakdown that allows the reduction of concrete pore size and, consequently, may reduce the corrosion process [5]. The carbonation of structures in urban and coastal regions of any country is generally very high. Carbonated concrete loses protective power of steel. Therefore it accelerates steel corrosion and related problems. Hence, the efficiency of SBA in resisting carbonation and reduction in permeability to improve the corrosion resistance must be studied in detail. Most of the studies based on SBA as a supplementary cementitious material were carried out to evaluate compressive strength[1,4,7,10]tensile strength and flexural strength of mortars and concretes [2,8,11], Modules of elasticity of concrete. Some of author also taken X-ray diffraction test on SBA paste [8]. The role of SBA in reducing the corrosion rate of reinforced concretes has shown potential, but need to be studied in detail. Hence, lot of research is necessary before such technology is ready for field applications. Moreover, long term effect of such treatment is not yet reported. as well as performance of SBA concrete in

IV. CONCLUSION

According to literature, As the sugar production isincreased, the quantity of bagasse ash

produced will also belarge and the disposal will be a problem.Sugarcanebagasseash has been tested for itsuse as a cement replacement material. The bagasse ash wasfound to improve some properties of the paste, mortar andconcrete including compressive strength, Flexural strength, tensile strength and water tightnessin certain replacement of cement with ash. The SBA in blended concrete had significantly higher compressive strength, higher tensile strength and higher flexural strength compare to that of the concrete without SBA. The results showed that reinforced concrete containing sugar cane bagasse ash has the lowest corrosion rates in comparison to reinforced concrete without the additive.

REFERENCES

[1]. Marcos Oliveira De Paula; Ilda De Fatima; Conrado De Souza;"Sugarcane bagasse ash as a partial Portland cementer placement material" This paper is part of Dyna, vol. 77, núm. 163, septiembre, 2010, pp. 47-54 Universidad Nacional de Colombia Medellín, Colombia.

[2]. R.Srinivasan; K.Sathiya; "Experimental Study on Bagasse Ash in Concrete" This journal is the Part of International Journal for Service Learning in Engineering Vol. 5, No. 2, pp. 60-66, Fall 2010 ISSN 1555-9033.

[3]. V. S. Aigbodion; S. B. Hassan; T. Ause and G.B. Nyior, "Potential Utilization of Solid Waste (Bagasse Ash)" This paper is part of the Journal of Minerals & Materials Characterization & Engineering, Vol. 9, No.1, pp.67-77, 2010 jmmce.org Printed in the USA.

[4]. BirukHailu and AbebeDinku, "Application of sugar cane BAGASSE ASH as a partial cement replacement material" This paper is part of the Journal of EEA, Vol.29, 2012.

[5]. R. E. Nunez-Jaquez; J. E. Buelna-Rodrguez; C. P. Barrios-Durstewitz; C. Gaona-Tiburcio; and F. Almeraya-Calderon, "Corrosion ofModified Concrete with Sugar Cane Bagasse Ash" This paper is part of Hindawi Publishing Corporation International Journal of Corrosion Volume 2012, Article ID 451864, 5 pages doi:10.1155/2012/451864

[6]. Vinícius N. Castaldelli ; Jorge L. Akasaki ; José L.P. Melges; , Mauro M. Tashima; Lourdes Soriano ; María V. Borrachero ; Jose Monzo and JordiPaya " Use of Slag/Sugar Cane Bagasse Ash (SCBA) Blends in the Production of Alkali-Activated Materials" Materials 2013, 6, 3108-3127; doi:10.3390/ma6083108.

[7]. U.R.Kawade; V.R.Rathi; Vaishali D. Girge, "Effect of use of Bagasse Ash on Strength of Concrete" This paper is part of the International Journal of Innovative Research in Science, Engineering and Technology, Vol. 2, Issue 7, July 2013.

[8]. S.Dharanidharan; L.Rajkumar; B.Karthick "An experimental study on mechanical properties of concrete byusing sugarcane bagasse ash" this paperis part of International journal of engineering sciences & research technology [Dharanidharan, 4(3): March, 2015] ISSN: 2277-9655.

[9]. T.Malyadri; J.Supriya, "Experimental Study on Bagasse Ash in Concrete by Partially Replacement with Cement" This paper is part of the International Journal of Computer Engineering In Research Trends olume 2, Issue 12, December-2015, pp. 995-1001 ISSN (O): 2349-7084.

[10]. Dr.M.VijayaSekhar Reddy; K.Ashalatha, M.Madhuri; P.Sumalatha, "Utilization Of Sugarcane Bagasse Ash (SCBA) In Concrete By Partial Replacement Of Cement" This paper is part of the IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 6 Ver. VI (Nov. - Dec. 2015), PP 12-16.

[11]. M. S. ChennakesavaRao; N. V. N. Prabath, "Green Concrete using Agro Industrial Waste (Sugarcane Bagasse ASH)" This paper is part of the International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-5 Issue-1, March 2015.