Study on Behavior of Brick Masonry Mortar Produced by use of Bagasse Ash

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Abstract— Repair and restoration work of reinforced-concrete (RC) structures is increasing because of the deterioration of aging infrastructures worldwide. Generally, plain mortar and polymer-modified mortar are widely used as repair materials for RC structures. In this study the effect of the combined use of polymers with supplementary cementitious materials (SCMs) on certain mechanical and durability properties (such as compressive and flexural strengths, water absorption, carbonation, and chloride penetration) of modified mortars is evaluated experimentally. Sugarcane bagasse ash (SBA) , is utilized to developed light weight bricks-that serve a purpose of solid waste management and energy efficient alternative low cost construction material. To replacing the cement, with that in mind a research was conducted by utilizing (SBA) with cement and sand. The research involved the preparation of mix proportions of various replacement level of cement by SBA such as 0%, 5, 10%, 15%, 20%, and 25%, With the cement sand ratio of 1:3. The testing cubes are 70.7mmX70.7mmX70.7mm in size.

Key words: Cement, Sand, Bagasse Ash, Mortar, Compressive Strength

I. INTRODUCTION

The need to conserve traditional natural resources that are facing contraction have obliged engineers to look for alternative materials. The production of conventional building materials consumes a lot of thermal and electrical energy and in turn pollutes air, water, and land. Disposal of solid waste generated from agricultural and industrial production activity is the other serious problem in fast developing countries like India. The accumulation of wastes is not only a burden to the industry, but also affects the environment adversely. Therefore, development of new technologies to recycle and convert waste materials into reusable materials is severally important for the protection of the environment and sustainable development of the society. Reuse of such wastes as a sustainable construction material appears to be a workable solution not only to the pollution problem, but also to the problem of the landfill and high cost of building materials. Fast Growth of population, Increasing urbanization, and the rising standard of living due to technological innovations have contributed to an increase in the Quantity and variety of solid wastes generated by industrial, mining, domestic, and agricultural activities. Annually, Asia alone generates 4.4 billion t of solid waste. The major quantity of waste generated from agricultural sources is sugarcane bagasse. India is the second largest producer of sugarcane in the world after Brazil. India alone generates approximately 90 million t of bagasse as a solid waste from the sugarcane industry, which is further reused as biofuel for the industrial boilers and power plants. The burnt residue of sugarcane bagasse is called as sugarcane bagasse ash (SBA) because these ashes are the final waste resulting from the agro industrial processes with no possibility to reduce it further. The potential production capacity of burnt sugarcane bagasse ash is approximately 7–8% of total bagasse consumed. The main composition of bagasse ash is siliceous oxide (SIO2) which is react with lime present in cement. The silicate content of bagasse ash may vary from depending upon burning and other properties like soil on which sugarcane is produced.

II. MATERIAL

A. Cement:

Cement used in the experimental work is ordinary Portland cement conforming to I.S 4031-1988.The O.P.C was classified into three grades, namely 33grade, 43grade, and 53 grade, depending upon the strength of the cement. In this experiment we used 43grade cement is used. .A typical test result of chemical composition of OPC cement given by manufacturer is shown in table.

Chemical composition	SIO2	Al2O3	Fe2O3	CaO	Mgo	Na2o	K2o	So4	Loi*
OPC	18.621 %	4.749 %	3.02 %	62.42 %	3.21 %	1.52 %	1.43 %	2.291 %	3.54 %

Table 1: Chemical composition of OPC

*LOI- loss on Ignition

Compressive strength(MPA)	44
Fineness (%)	8
Specific gravity	3.157
Initial setting time(Minute)	65
Final setting time	320

Table 2: Physical properties of OPC

B. Bagasse Ash

Bagasse ash is obtained from New India Sugar Factory In Kushinagar Distict In Uttar Pradesh. India is the second largest producer of sugarcane in the world after Brazil. India alone generates 90milion tons of bagasse as a waste material, from sugarcane industry. Bagasse is a residue obtained from the burning of bagasse in sugar producing factory. Bagasse is the cellular fibrous waste product after the extraction of the sugar juice from cane mills. Its currently used as a bio-fuel and in the manufacture of pulp and paper products and building materials. For each 10 tons of sugarcane crushed, a sugar factory produces nearly 3.1 tons of wet bagasse which is a by-product of the sugar cane industry. When this bagasse is burnt the resultant ash is bagasse ash. Western Maharashtra is having maximum

number of sugar factories, these factories faces a disposal problem of large quantity bagasse. The effective use of these waste products is a challenging task for a researcher through economical and environmental impact. This material contains amorphous silica which is indication of cementing properties. The laboratory test results on bagasse ash are as follow

Colour	Black
Specific gravity	1.305
Fineness Modulas	10

Table 3: Physical properties Bagasses Ash

Sr. No	Description of properties	Percentage (%)
1.	Silica (SiO_2)	64.34
2.	Magnesium (MgO)	0.853
3.	Calcium (CaO)	10.4
4.	Iron (Fe_2O_3)	4.54
5.	Sodium (Na_2O)	1.05
6.	Potassium (K_2O)	3.56
7.	Alumina (Al_2O_3)	11.47

Table 4: Chemical composition of Bagasse Ash

C. Fine Aggregate

Fine aggregate was purchased which satisfied the requirement of fine aggregate required for experimental work and conforming to zone-2, as per IS 383:1970. The sand was oven-dried and sieved to eliminate any foreign particles before mixing.

- Fineness modulus=2.81
- Specific gravity=2.61
- Silt content=2.63

III. EXPERIMENTAL WORK

In this study, cement is replaced with bagasse ash and percentage of sand is kept constant with ratio of 3 times of cement and (2%) of super plasticizer for production of mortar. The mortars for each composition were manufactured by weight batching. The test like compressive strength, water absorption carried out for (SBA-SAND – CEMENT) mortar. After casting, mortar cubes were taken out of the moulds and put for curing for desired no of days till testing.

Sample	% Replacement	SBA (sugarcane bagasse ash)(gram)	Sand (gram)	Cement (gram)	Super plasticizer (SNF)(By weight of cement)(gram)
M0	0	0	6000	2000	40
M1	5	100	6000	1900	40
M2	10	200	6000	1800	40
M3	15	300	6000	1700	40
M4	20	400	6000	1600	40
M5	25	500	6000	1500	40

Table 5: The composition of different- different material

Average Compressive Strength N/mm^2	Age (Days)	Control Mix Mortar	Percentage replacement With SCBA				
			M1 (5 %)	M2 (10 %)	M3 (15 %)	M4 (20 %)	M5 (25 %)
	7	4.8	4.9	5.11	5.62	4.88	4.68
				2			
	14	6.2	6.39	7.21	7.76	6.28	5.90
	28	7.0	7.10	7.47	8.81	7.00	6.26

Table 6: Compressive Strength Of Mortar

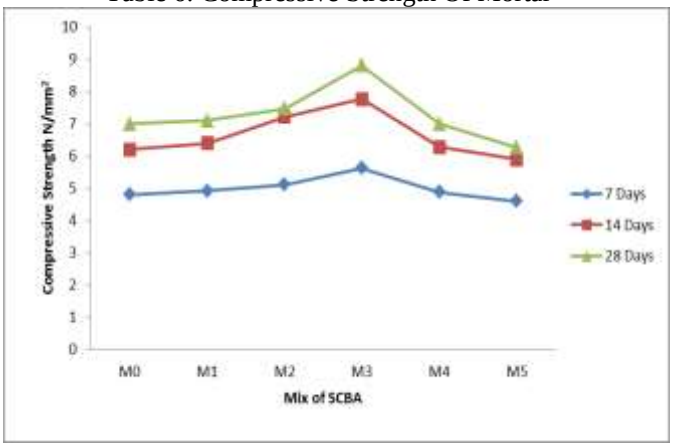

Fig. 1: Graph of Compressive strength at various mix proportion of SCBA

IV. CONCLUSION

- At the initial ages, as replacement level of SCBA increases the compressive strength also increases.
- In terms of compressive strength (SBA-SAND-CEMENT) bricks are satisfy the requirement of (I.S 1077(BIS-1992d)). So it is suitable for another alternative material.
- To protect the clay resources and environment by using these bricks in structural building, the builder saves around 15 to20% of structural steel and concrete as these bricks reduce the dead load on the building.
- The optimum strength is obtained at the level of 15% of OPC replace by SCBA.
- Using SCBA as replacement of OPC in mortar, the emission of greenhouse gases can be reduced up to a greater extent.

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