EFFECT OF BAGASSES ASH ON THE PROPERTIES OF HIGH STRENGTH S.C.C.

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ABSTRACT:-

The researches has shown that every one ton of cement manufacture releases half ton of carbon dioxide, so there is an immediate need to control the usage of cement. On the hand materials wastes such as Sugar Cane Bagasse Ash is difficult to dispose which in return is environmental Hazard. The Bagasse ash imparts high early strength to concrete and also reduce the permeability of concrete. The Silica present in the Bagasse ash reacts with components of cement during hydration and imparts additional properties such as chloride resistance, corrosion resistance etc. Therefore the use of Bagasse ash in concrete not only reduces the environmental pollution but also enhances the properties of concrete and also reduces the cost. An experimental investigation is carried out to study behavior of M70 concrete using bagasses ash as a partial replacement for OPC 53 grade cement is partially replace with 0%, 10%, 20%, 30% by SCBA(Sugar Cane Bagasses Ash) polycarboxylate based super plasticizer is added to concrete. Concrete cube, cylinders will be cast and test on it. Main aim is to determine the effect of bagasses ash as partial substitute of cement on the properties of self-compacting concrete in fresh state and hardened state. Fresh concrete test like compaction factor test will be undertaken as well as hardened concrete test like compressive strength at the age of 7 days, 28 days will be obtain and also durability aspect of bagasse concrete for sulphates attack will test.

KEY WORDS:- Sugar Cane Bagasse Ash (SCBA), Sulphate Attack On Concrete Cubes, self-compacting concrete, Compressive Strength, Fresh property

Introduction:-

Ordinary Portland cement is most extensively used construction material throughout the world and it is most expansive all the material. In addition there is environmental concern in production of cement. This environmental problem will most likely be increased due to exponential demand of Portland cement. Researchers focusing on ways of utilizing industrial and agriculture waste as a source of raw materials for cement. Industrial wastes, such as blast furnace slag, fly ash and silica fume are being used as supplementary cement replacement material. Currently, there has been an attempt to utilize the agricultural waste as are placement material. One of the agro waste **Sugarcane Bagasse Ash (SCBA)** which is a fibrous waste product obtained from sugar mills as by product Juice is extracted from sugarcane then ash produced by burning bagasse at very high temperature. The Sugarcane Bagasse Ash having amorphous silica which has pozzolanic properties can be used as cement replacement material. A few studies have been carried out on the ashes obtained directly from the industries to study pozzolanic activity and their suitability as binders, partially replacing cement. Therefore it might possible to use sugarcane bagasse ash as cement replacement material to improve quality and reduce the cost of construction materials. India being one of the largest producers of sugarcane in the world produces 300 million tons per year and large quantity of sugarcane bagasse is available from sugar mills. Sugarcane bagasse is partly used as fuel at the sugar mill. The sugarcane bagasse consists of approximately 50% of cellulose, 25% of hemicelluloses and 25% of lignin. When juice is extracted from the sugarcane stalk, the waste material is burned at high temperature to produces bagasse ash as a cement replacement material.

Experimental Investigation:-

[1]Material Used:

Cement- Ordinary Portland cement of 53 grade from a single batch was used for the entire work and care has been taken that it has to been stored in airtight containers to prevent it from being affected by the atmospheric and monsoon moisture and humidity. The cement procured was tested for physical requirements in accordance with IS:12269-1987 and for chemical requirements in accordance with IS: 4032-1977.

Sugarcane Bagasse Ash- Sugarcane bagasse consists of approximately 50% of cellulose, 25% of hemicelluloses of lignin. Each ton of sugarcane generates approximately 26% of bagasse (at a moisture content of 50%) and 0.62% of residual ash. The residue after combustion presents a chemical composition dominates by silicon dioxide (sio2).

Fig.1 Burnt Sugarcane Bagasses ash

In spite of being a material of hard degradation and that presents few nutrients, the ash is used on the farms as a fertilizer in the sugarcane harvests. In this sugarcane bagasse ash was collected during the cleaning operation of a boiler in the sugar factory.

Fine Aggregate- The river sand, passing through 4.75 mm sieve and retained on 600 μm sieve, conforming to Zone II as per IS 383-1970 was used as fine aggregate in the present study. The sand is free from clay, silt and organic impurities. The aggregate was tested for its physical requirements such as gradation, fineness modulus, specific gravity and bulk modulus in accordance with IS: 2386-1963.

Coarse Aggregate- Throughout the investigations, crushed coarse aggregates of 20mm and 10 mm greet procured from the local crushing plants was used. The aggregate was tested for its physical requirements such as gradation, fineness modulus, specific gravity and bulk density etc. in accordance with IS: 2386-1963 and IS: 383-1970.

Silica Fume-

Silica fume is a byproduct of producing silicon metal or ferrosilicon alloys. One of the most beneficial uses for silica fume is in concrete. Because of its chemical and physical properties, it is a very reactive pozzolan. Concrete containing silica fume can have very high strength and can be very durable.

Table-1: Physical properties of OPC and Baggase Ash

Physical properties	Ordinary Portland Cement	Sugarcane Baggase Ash
Initial Setting Time	37.5	-
Final setting time	560	-
Specific Gravity	3.15	2.12

[2] Mixing Proportion:-

Following table showing mix design of SCC with addition of different proportion of Bagasse Ash. Bagasse Ash replacement ranges from 0% to 30% in the step of 10% by volume. Course aggregate and Fine aggregate volume remained constant.

Table-2: Mix Proportion

Cement (kg/m^3)	F.A (kg/m^3)	C.A (kg/m^3)	Water (Ltr/m^3)	SP (Ltr/m^3)
583	840	720	190	9.50

Table-3: Partial Replacement of Bagasses Ash with Cement

Replacement of Bagasses Ash with Cement	**Cement (Kg)**	**Bagasse Ash (Kg)**	**Sand (Kg)**	**Course aggregate (Kg)**
0%	**583**	**0**	**840**	**720**
10%	**524**	**58.3**	**840**	**720**

20%	**466**	**117**	**840**	**720**
30%	**408**	**175**	**840**	**720**

[3] Preparation of Samples:-

In this study totally 36 cubes were casted by replacing cement with SBA replaced by 0%, 10%, 20%, 30% for three different water cement ratios. For each water cement ratio and replacements 3 cubes were caste and its average compressive strength is tabulated for 7, 14 and 28 days. All the materials used were batched by weight proportions. Concrete were mixed in drum type mixer in the laboratory. Before starting mixer machine the mixer drum was fully washed using portable water and allowed to dry for 5 minutes. The coarse aggregate and river sand mixed for 2 minutes. Finally cement, SBA and remaining water was added and mixing continued until the concrete gets homogeneous. The same procedure was followed for various mixes. 150 mm cube moulds were used to cast the specimen and a vibrating table was employed to compact the concrete. Immediately after casting the specimens were covered with plastic sheets for 24Hrs to prevent the evaporation of water from the concrete. They were demolded after 24hrs and cured in water under ambient temperature until they were tested.

[4] Test on fresh SCC:-

Tests of SCC on fresh properties include slump flow, v-funnel test and L-box test. The result of this test is given in table 3.

Slump Flow: - The maximum flow of concrete in absence of any obstructions was conducted by slump flow test in which the slump cone was filled mixed without any compaction. The value of Slump flow is the average of the two diameters cone in perpendicular directions of the concrete after lifting the cone and until concrete stops flowing.

Fig.2- Slump Flow Test

V-funnel: - This test is used to determine the filling ability properties (flow ability) of the concrete. The funnel is filled up with 12 liter of concrete. Find the time taken for its flow down. V-funnel value is the time of concrete flowing from the opening at the bottom of the funnel. Both the test gives indications of flow ability of concrete.

Fig.3- V-funnel test specimen

L- Box: - This test assesses the flow of concrete and also the extended to which the concrete is subjected to blocking by reinforcement. About 14 liter of concrete is required for the test and let it rest for 1 minute before the test.

Fig.4- L-Box test

Table 3:- Result of fresh concrete

Test	Properties	Time	Flow
Slump Flow	Falling ability	8 sec.	740
V-funnel	Falling ability	12 sec.	-
L-box	Passing ability	1.5,2 sec.	-

Results and Discussion:-

[1]Compressive strength:-

Concrete cubes of size 150×150×150mm were casted and tested for compressive strength in normal water at ages of 7, 28 days for 0%, 10%, 20%, and 30% replacement of sugarcane bagasse ash for M70 grade of concrete.

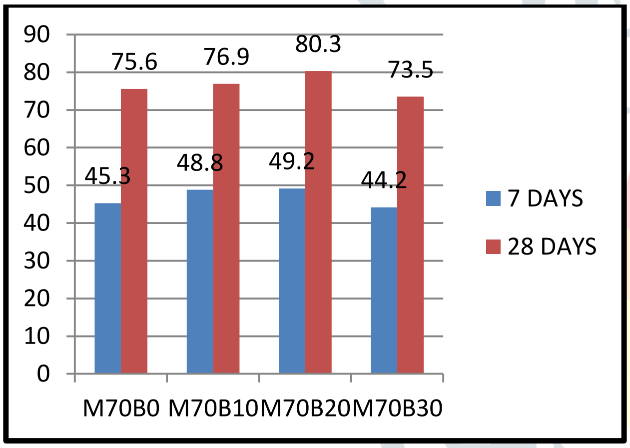

Fig.5- Compressive strength of concrete at ages of 7 days and 28 days

[2]Flexural strength:-

Fig.6 shows flexural strength results for mix with different percentage of Bagasses ash.

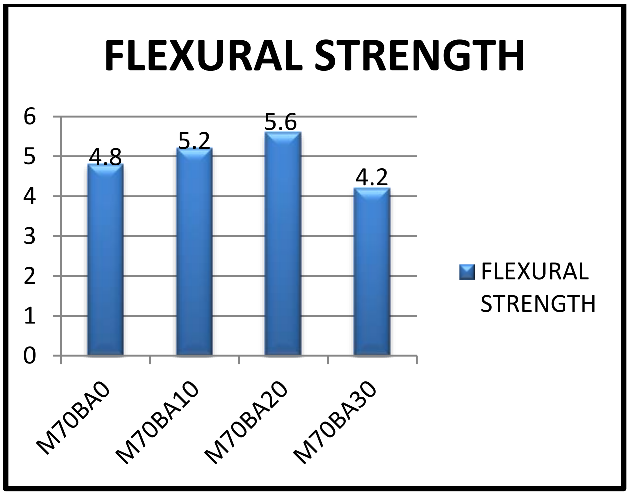

Fig.6- Flexural strength of concrete at ages of 28 days

CONCLUSION:-

1. Replacing cement by up to 20% SBA, in terms of weight, had no significant effect on mortar fresh state properties.
2. SBA/c was found to be significant only for the compressive strength at 28 d.
3. Replacing cement by up to 30% SBA was found that relatively decrease in compressive strength of concrete.
4. Partial replacement of cement with SCBA improved the performance of lightweight concrete more than the other concrete types.

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