Effect of Cement Sand and Bagasse Ash Mix on OMC and MDD Result

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Abstract— Sugarcane bagasse ash (SBA), is utilized in various application for so many application. so we are conducting a test on different-different proportion of SBA, with cement and sand. To replacing the clay, with that in mind a research was conducted by utilising (SBA) with cement and sand. The research involved the preparation of five mix proportion. The result shows decreased in Maximum Dry Density with increased in bagasse ash. The table:1, show the mix proportion.

Key words: Cement, Sand, Bagasse Ash, O.M.C, M.D.D

I. INTRODUCTION

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).

S. No.	Mix Proportion
1	M1=15% (S.B.A) + 65% (SAND) +20% (CEMENT)
2	M2=20% (S.B.A) + 60% (SAND) +20%(CEMENT)
3	M3=25% (S.B.A) +55% (SAND) +20% (CEMENT)
4	M4=30%(S.B.A) +50% (SAND) + 20% (CEMENT)
5	M5=35% (S.B.A) +45% (SAND) +20% (CEMENT)

Table 1: Mix proportion of sba sand and cement

II. MATERIAL USED

A. Ordinary Portland 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	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	SO_4	LOI
Percentage	18.6	4.79	3.00	62.4	3.21	1.52	1.4	2.29	3.53

Table 2: Chemical composition of OPC 43 grade

B. Bagasse Ash

The use of different cement replacing materials has become a common practice in the construction industry. Most of these cement replacement materials are by products of different industries and agricultural wastes. Blast furnace slag, silica fume, fly ash and rice husk can be sited as an example. Sugarcane bagasse ash has also been found to have such pozzolanic property.

Bagasse is a cellulose fibre remaining after the extraction of the sugar-bearing juice from sugarcane. Bagasse ash is one of the biomass sources and valuable by products in sugar milling that often uses bagasse as a primary fuel source to supply all the needs of energy to move the plants. The bagasse ash is about 8-10% of the bagasse and contains unburned matter, silica and alumina. The bagasse ash material is collected from Birla sugar mill near kushinagar district in Uttar Pradesh.

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

S. No.	Wt. of Mould	Wt. of Mould+ soil	Wt. of Crucible +wet soil (a)	Wt. of crucible +Dry soil (b)	Wt. of Crucible (c)	Wt. of wet sample	Vol. of mould	Density	Water content	Dry density
1	2836	4260	35.590	34.655	17.452	1424	1000	1.424	5.4350	1.3505
2	2836	4325	42.797	40.737	17.892	1489	1000	1.489	9.017	1.3658
3	2836	4392	41.644	39.108	16.878	1556	1000	1.556	11.408	1.3966
4	2836	4492	38.973	36.372	16.830	1656	1000	1.656	13.309	1.4614
5	2836	4555	36.940	34.204	16.806	1716	1000	1.716	15.725	1.4828

6	2836	4710	44.593	40.383	16.354	1874	1000	1.874	17.520	1.5946
7	2836	4700	44.827	40.131	17.479	1864	1000	1.864	20.731	1.5530

Table 3- Result of sample M1 (15% SBA + 65% SAND + 20% CEMENT)

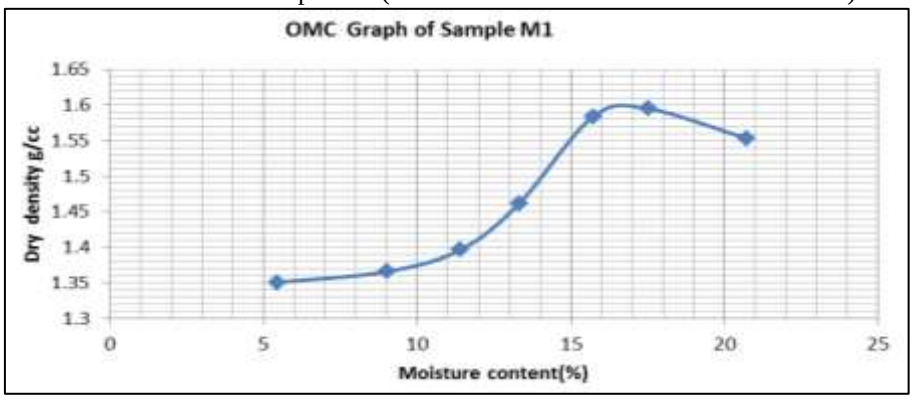

Fig. 1: OMC Graph of Sample M1

Result- The OMC and MDD result of sample for (15% SBA + 65% SAND + 20%CEMENT) are shown.

OMC= 17.5204 %, MDD= 1.5946 gm/cc

S. No.	Wt. of Mould	Wt. of Mould+ soil	Wt. of Crucible +wet soil (a)	Wt. of crucible +Dry soil (b)	Wt. of Crucible (c)	Wt. of wet sample	Vol. of mould	Density	Water content	Dry density
1	2830	4175	26.078	25.121	15.726	1345	1000	1.345	10.186	1.220
2	2830	4278	29.435	28.089	16.866	1448	1000	1.448	11.993	1.293
3	2830	4357	25.659	24.702	18.928	1527	1000	1.527	16.574	1.3099
4	2830	4490	29.064	26.917	17.488	1660	1000	1.660	22.77	1.352
5	2830	4565	26.465	24.257	15.248	1735	1000	1.735	24.508	1.393
6	2830	4600	33.722	30.08	18.123	1770	1000	1.770	30.45	1.356
7	2830	4580	33.722	30.1	18.013	1750	1000	1.750	29.966	1.340

Table 4- Result of sample M2 (20% SBA + 60% SAND + 20% CEMENT:

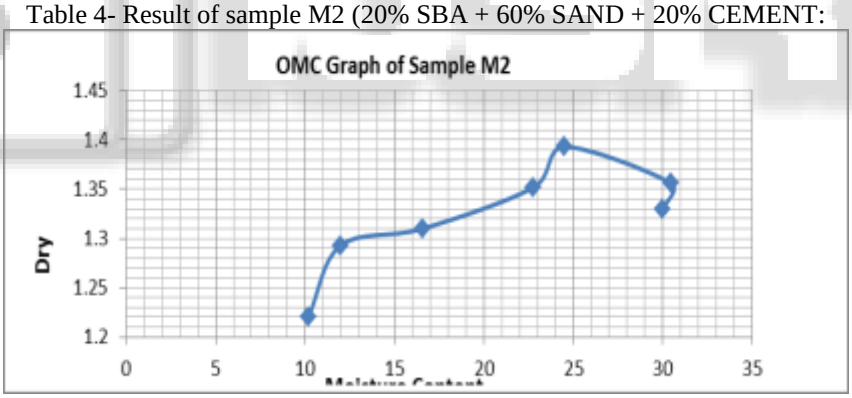

Fig 2: OMC Graph of Sample M2

Result- The OMC and MDD result of sample (20% SBA + 60% SAND + 20% CEMENT) are shown.

OMC= 24.508%, MDD= 1.393gm/c

S. No.	Wt. of Mould	Wt. of Mould+ soil	Wt. of Crucible +wet soil (a)	Wt. of crucible +Dry soil (b)	Wt. of Crucible (c)	Wt. of wet sample	Vol. of mould	Density	Water content	Dry density
1	2830	4064	30.098	29.286	17.151	1234	1000	1.234	6.6913	1.1570
2	2830	4082	33.840	32.195	17.420	1257	1000	1.257	11.133	1.1265
3	2830	4115	30.177	28.672	16.792	1285	1000	1.285	12.67	1.1404
4	2830	4285	31.741	29.786	18.609	1455	1000	1.455	17.49	1.2000
5	2830	4340	33.999	31.258	18.629	1510	1000	1.510	21.704	1.2407
6	2830	4440	33.273	29.993	16.867	1610	1000	1.610	24.988	1.2881
7	2830	4555	37.032	32.287	15.755	1725	1000	1.725	28.701	1.3403
8	2830	4535	34.940	29.884	15.648	1705	1000	1.705	35.44	1.2588

Table 5- Result of sample- M-3 (25% SBA + 55% SAND + 20% CEMENT)

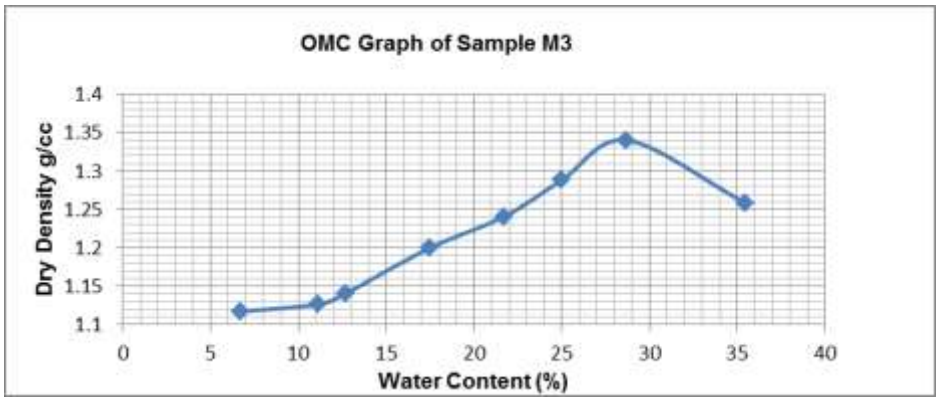

Fig 3: OMC Graph of Sample M3

Result-The OMC and MDD result of sample (25% SBA + 55% SAND +20% CEMENT) are shown. (OMC= 28.701 %, MDD= 1.3403gm/cc)

S. No.	Wt. of Mould	Wt. of Mould+ soil	Wt. of Crucible +wet soil (a)	Wt. of crucible +Dry soil (b)	Wt. of Crucible (c)	Wt. of wet sample	Vol. of mould	Density	Water content	Dry density
1	2830	3812	30.09	29.28	17.151	1040	1000	1.040	6.6930	0.974
2	2830	3946	25.823	24.789	15.243	1116	1000	1.116	10.8317	1.0069
3	2830	4080	26.254	25.149	16.812	1250	1000	1.250	13.2541	1.1037
4	2830	4140	27.968	26.461	17.117	1310	1000	1.310	16.1279	1.1280
5	2830	4220	26.393	25.007	17.581	1390	1000	1.390	18.6641	1.1713
6	2830	4340	26.925	25.572	18.917	1510	1000	1.510	20.3300	1.2548
7	2830	4380	30.486	27.924	17.266	1550	1000	1.550	24.0380	1.2496
8	2830	4450	29.157	26.349	15.710	1620	1000	1.620	26.3934	1.2817
9	2830	4550	31.878	28.694	17.865	1720	1000	1.720	29.4025	1.3291
10	2830	4525	35.541	30.770	16.754	1695	1000	1.695	34.039	1.2645

Table 6- Result of sample M4- (30% SBA + 50% SAND + 20% CEMENT

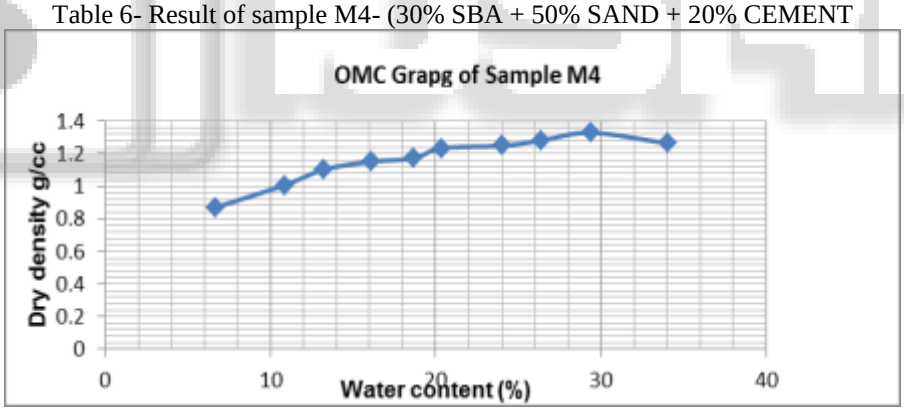

Fig 4: OMC Graph of Sample M4

Result- The OMC and MDD result of sample (25% SBA + 55% SAND +20%CEMENT) are shown. OMC=29.4025 %, MDD= 1.3291gm/cc.

S. No.	Wt. of Mould	Wt. of Mould+ soil	Wt. of Crucible +wet soil (a)	Wt. of crucible +Dry soil (b)	Wt. of Crucible (c)	Wt. of wet sample	Vol. of mould	Density	Water content	Dry density
1	5710	6780	29.640	27.803	17.015	1070	1000	1.070	10.831	0.836
2	5710	6820	29.750	27.903	17.016	1110	1000	1.110	16.965	0.949
3	5710	6950	30.308	28.035	17.257	1240	1000	1.240	21.089	1.024
4	5710	7060	33.907	30.597	18.853	1310	1000	1.310	28.184	1.05317
5	5710	7275	38.195	32.962	16.723	1390	1000	1.390	32.224	1.1835
6	5710	7305	33.595	28.727	17.442	1510	1000	1.510	43.136	1.114
7	5710	7325	36.702	30.734	17.176	1550	1000	1.550	44.018	1.11

Table 7- Result of sample M5- (35% SBA + 45% SAND + 20% CEMENT)

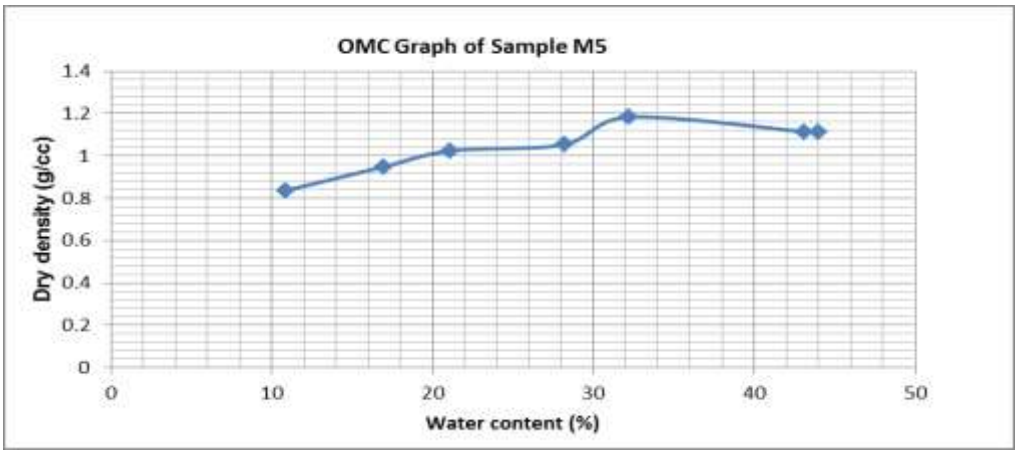

Fig 5: OMC Graph of Sample M5

Result- The OMC and MDD result of sample for (25% SBA + 55% SAND +20%CEMENT) are shown.
OMC=32.224 %
MDD= 1.1835gm/cc.

Discussion- The sample M1, M2, M3, M4, and M5 will show the reduction in MDD value and at same time OMC will be increases. As the bagasse ash content increased extra water required for the pozzolanic reaction and hydration of cement.

III. Result and Discussion

A. Maximum Dry Density Optimum Moisture Content

There was a general decrease in maximum dry density for all the five sample as shown in FIG. The MDD generally decreased with higher bagasse ash. Generally, there is increase in the optimum moisture content (OMC) increased with higher bagasse ash content.

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Higher replacements of cement by bagasse ash resulted in higher normal consistency and longer setting time.

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