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Laboratory Investigation of Bituminous Mix Properties using Sugarcane Ashes (Bagasse)

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***Abstract:** In India there is an excessive use of sugarcane. After the use of sugarcane their waste called "Bagasse" becomes a waste called "Bagasse" becomes a waste which is biodegradable.*

The waste product remains after the use of sugarcane are usually burn in the air which causes air pollution so the use of sugarcane ashes is beneficial. So we use crushes of sugarcane and crushes of sugarcane ashes in bituminous mix to increase the stability of the mix.

This paper summarizes the ongoing researches about the experimental investigation on the use of bagasse ash in construction of low volume traffic loads.

The main focus of this research was to improve the transport industry so as to result in greater economy and mobility of goods and services by developing economic roads and also to utilize the various agro wastes in the construction industry to result in suitable waste management for environmental susceptibility and eco-conservation.

In this case sugarcane bagasse ash is being utilized for the construction of low volume traffic roads (village roads, city street roads and other arterial roads) .

Bagasse is a heterenous material containing around 30-40 % of "pith" fibre, which is derived from the core of the plant and is mainly parenchyma material, and "bast", "rind" or "stem" fibre which makes up the balance and is largely derived from sclerenchyyama material. These properties make bagasse particularly problematic for paper manufacture and have been subject of a large body of literature.

***Keywords:** Aggregates, bitumen, sugarcane, sugarcane ashes.*

I. INTRODUCTION

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 tons per year .

The processing of it in sugar mill generates about 10 million tons of SCBA as a waste material one ton of sugarcane can generate approximate 26% of bagasse and 0.62% of residual ash .The residue after combustion present a chemical composition dominates by silicon dioxide.

The SCBA contains high amounts of unburnt matter, silicon aluminum and calcium oxide. The main parameter responsible for this improvement was higher silica content. Bagasse ash contains amorphous silica and display good pozzolanic property. Bagasse is often used as a primary fuel source for sugar mills; when burned in quantity, it produces sufficient heat energy to supply all the needs of a typical needs of suagarmill.

The dumping of these industrial wastes in open land poses a serious threat to the society by polluting the air and waste bodies. This also adds the no avaibilty of land for public use. SCBA was tested in various part of the world and found the ash can improve the compressive strength of the material.

In present day, large amount of plastic waste is being produced everyday and disposal of such a large amount of plastic waste is a big problem. The weight of ordinary concrete is very high.

A. Aim

To modifies properties of bituminous mix by adding sugarcane ashes.

B. Objectives

1) To evaluate waste sugarcane ashes modified bituminous mix properties and compare with convential mix.
2) To compare and evaluate effect of different sizes of waste sugarcane ashes on bituminous mix.
3) To compare and evaluate effect of different proportion of sugarcane ashes on bituminous mix.
4) To compare the workability and various strengths for different percentage substitutions of cement and sand with sugarcane bagasse ash.

II. MATERIALS USED AND PROPERTIES

A. Materials Used

1) Aggregates

a) Coarse aggregates
b) Fine aggregates
c) Filler Material

2) Bitumen

a) Bitumen VG-30
b) Sugarcane Ashes
c) Powder form of Ashes

B. Properties of Materials

1) Coarse Aggregates

a) Impact Test - 9.56%
b) Specific Gravity Test - 1.03%
c) Crushing Value Test - 24.05%
d) Water Absorption -0.8% Test Value
e) Shape Test -25%

2) Bitumen

a) Specific Gravity Test -1.01%
b) Penetration Test Value -65%
c) Ductility Test -68.5%
d) Softening Point Test -49%

III. EXPERIMENTAL RESULTS

A. Marshall Stability Test

The Marshall stability and flow test values are helpful to the prediction of pavement performance measure for Marshall Mix Design Method. The Marshall Stability test of specimen measures the maximum load at a loading rate of 50.8mm/minute.

The Marshall Mix Design Method was developed by Bruce Marshall Mississippi state highway department and it is applicable to hot mix maximum size of aggregate used for this test is 2.5cm.

In India bituminous concrete mix is commonly designed by Marshall Method. The stability of a specimen is defined as maximum load is carried by a compacted specimen at a standard temperature of 60°C. The flow is measured as deformation in units of0.25mm between no load and maximum load carried by a specimen at stability test.

B. Sample Preparation

Take 1200gms of aggregates and filler material is heated to a temperature of 175-190°. Bitumen is heated to a temperature of 120-125° with percentage of bitumen 4.0 to 6.0%.The selected heated aggregates and bitumen are thoroughly mixed at a temperature of 150-160°C. Later, the mix is placed in a preheated mould and compacted by a rammer with 75 blows on the either side at temperature of 135-150°C. The weight of aggregates and bitumen taken for the preparation of the specimen may be suitability altered to obtain a compacted thickness of 63.5+/-mm.

1) Calculation of Optimum binder Content

Table: 1 shows the results of different bitumen percentages

% of bitumen	Wt of Bitumen (gm)	Height (Cm)	Wt of specimen		G_m	G_t	V_v	V_b	VMA	VFB	Proving ring reading	Stability value	Flow value
			In air (W_a)	In water (W_w)									
4.5	58.5	5.7	1341	800	2.48	2.68	7.37	10.78	18.15	59.385	110	596.42	5.70
	58.5	5.8	1345	800	2.47	2.68	7.78	10.73	18.51	57.98	110	572.32	5.85
	58.5	5.7	1345	800	2.47	2.68	7.78	10.73	18.51	57.98	105	568.31	5.95
Avg					2.47	2.68	7.644	10.750	18.395	58.449		579.0	5.83
5.0	65	5.9	1355	810	2.49	2.655	6.340	11.959	18.299	65.352	230	1140	5.45
	65	5.9	1346	800	2.47	2.655	7.133	11.858	18.990	62.440	210	1041.946	5.60
	65	6.0	1353	810	2.49	2.655	6.134	11.985	18.119	66.146	230	1141.274	6.0
Avg					2.48	2.655	6.536	11.934	18.470	64.613		1107.73	5.68
5.5	71.5	5.8	1359	820	2.52	2.634	4.261	13.277	17.539	75.703	255	1323.528	4.0
	71.5	5.8	1359	820	2.52	2.634	4.261	13.277	17.539	75.703	255	1323.528	3.6
	71.5	5.8	1358	820	2.52	2.634	4.154	13.29	17.446	76.190	240	1245.615	3.65
Avg					2.52	2.634	4.226	13.282	17.508	75.865		1297.56	3.75
6.0	78	6.0	1362	830	2.56	2.613	2.026	14.638	16.664	87.841	220	1091.61	6.15
	78	5.9	1359	830	2.57	2.613	1.688	14.688	16.376	89.694	205	1017.114	6.0
	78	5.9	1359	830	2.57	2.613	1.688	14.688	16.376	89.694	205	1018.114	5.50
Avg					2.57	2.613	1.801	14.672	16.472	89.069		1042.279	5.88

Table 2 shows the average results of bagasse in bitumen

% Of Bagasse In Bitumen	G_m	G_t	V_v	V_b	Vma	Vfb	Stability Value	Flow Value
0	2.48	2.63	5.50	13.10	18.61	70.45	1176.66	5.47
5	2.52	2.63	4.28	13.27	17.56	75.66	1276.67	5.68
10	2.55	2.63	3.39	13.40	16.78	79.81	1270	5.66
20	2.50	2.63	4.72	13.21	17.93	73.85	1310	5.60

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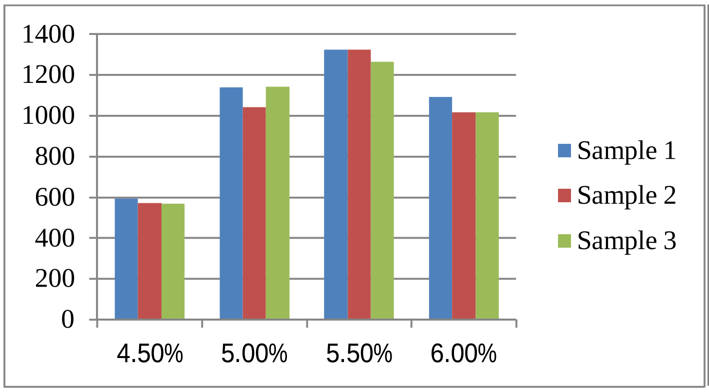
IV. RESULTS AND DISCUSSIONS

A. Marshall Stability Results

Increase in stability values as the bagasse content increases in the mix up to optimum binder content in the mix and later decrease in stability values as the Bagasse increase in the mix. But we cannot say in the same manner in case of flow values.

B. Flow Value Results

The increase of Bagasse in the mix does not necessarily increase the flow values. The increase of the Bagasse in mix decreases the stability value and the more Bagasse add the lower is the stability, but this is not the case for the flow value.



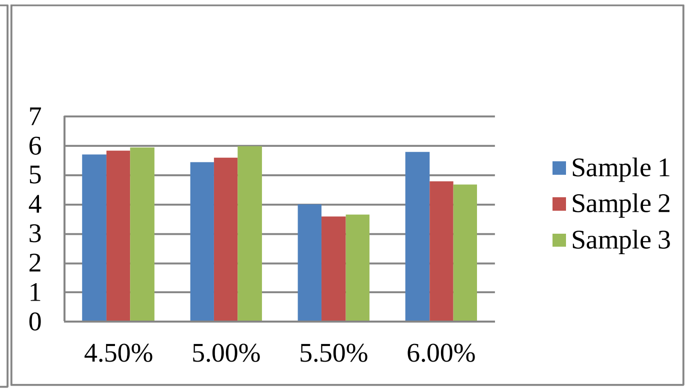
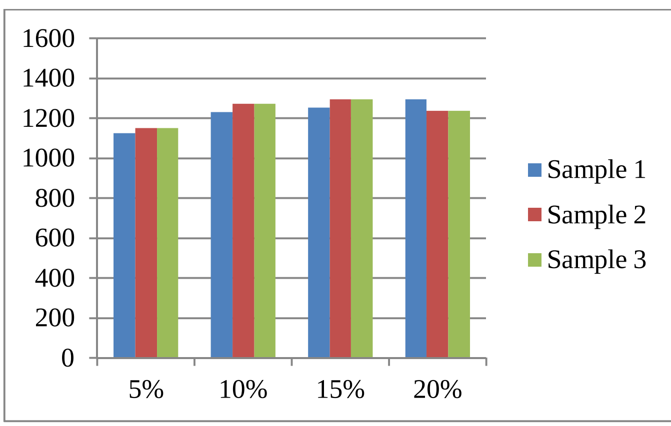


Fig 1: Stability values for different values for different Mix proportions of bitumen Fig 2: Flow values for different mix proportion of bitumen



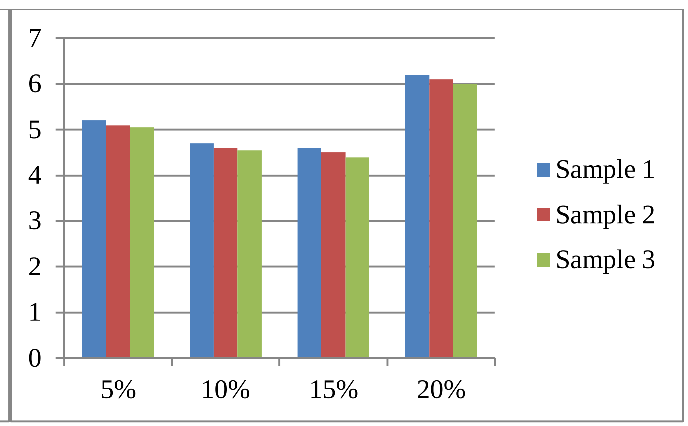


Fig:3 Stability values of different percentages of bagasse in Binder Fig 4: Flow values of different percentages of bagasse in binder

V. CONCLUSION

A. This research is intended to develop the relationship between the normal asphalt mix and the asphalt mix which developed by the concept of bagasse used as admixture in binder.

B. The Marshall stability values which obtained by adding the admixtures were increased, when compared with the Mrshall Stability values of normal asphalt concrete mix.

C. The whole experimental study was carried under OBC 4.84% since the Marshall stability and flow value for the mix was considerably nominal when compared with 4.5%, 5.0%, 6.0% of bitumen contents in the mixes.

D. The study was carried under various percentages of bagasse which are tabulated and shown in the above chapters. Due to the addition of mixture like bagasse to the normal asphalt concrete mix, the Marshall values were increased from 1300kg.

E. The value of optimum percentage of admixture is 10% at which the stability and flow values are 1300 kg.

F. Therefore from the above values it is clear that the load carrying capacity values of pavement will get increase. Not only the increment in load values and the overall performance of the pavement but also the maintenance cost of the pavement will get reduce even though the initial cost is somewhat high.

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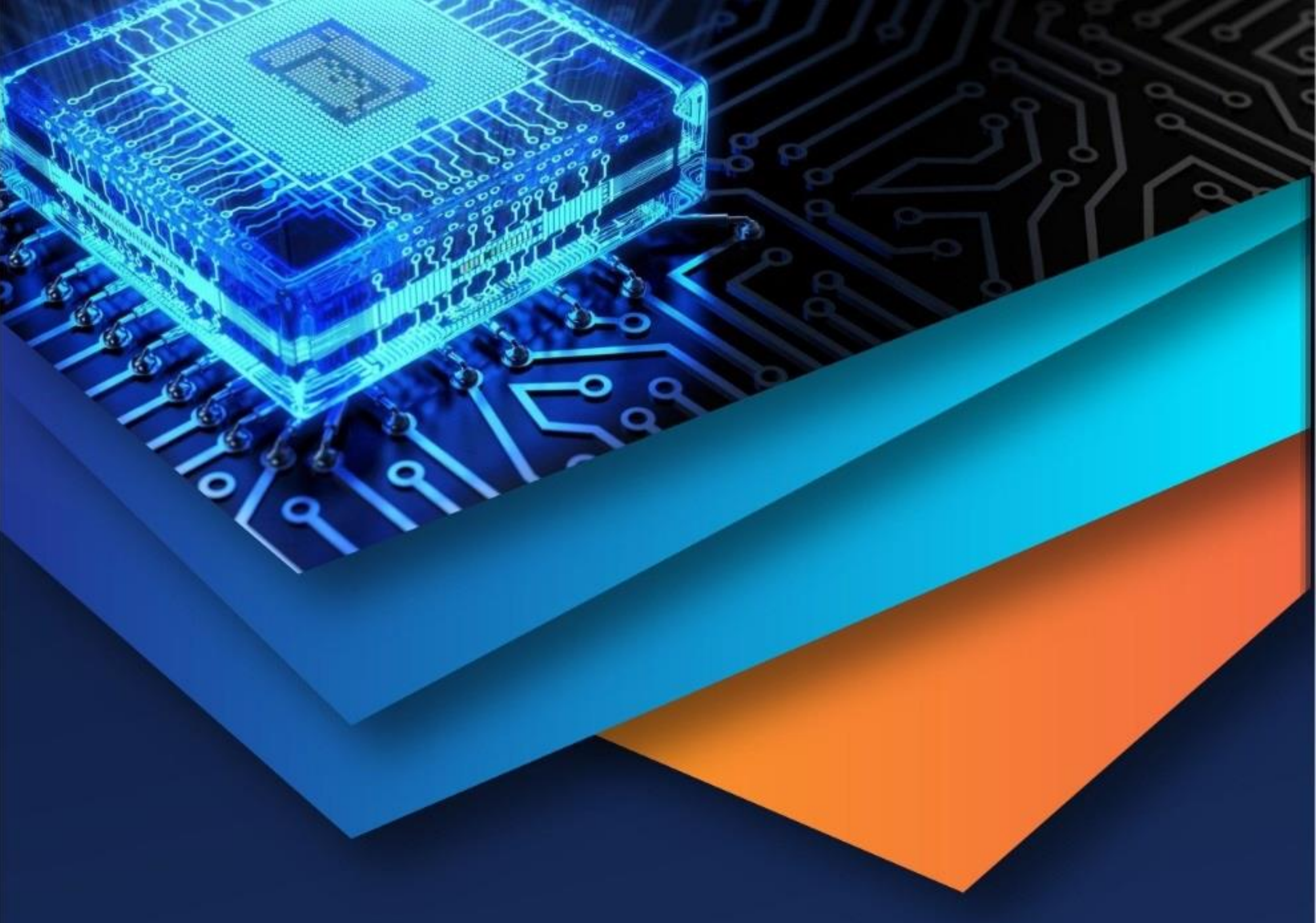

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