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AN EXPERIMENTAL INVESTIGATION ON USE OF RICE HUSK ASH IN AN BITUMINOUS CONCRETE

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Abstract: The increasing call for of production material has in a round about way caused exploitation of herbal cloth and environmental pollution. The use of agricultural by products after burning, grinding and sieving in cement has been employed as an opportunity of cement and great aggregates. In this research experimental study turned into made at the outcomes of the use of rice husk ash (RHA) as an alternative filler in bitumenious concrete . In the take a look at, it became investigated to use the rice husk ash (RHA) within the hot mix asphalt as mineral filler. RHA in specific proportions (3%, 5%, 7%, and 9%) as mineral filler. The quantity of most fulfilling bitumen and the value of Marshall Stability (MS) were decided with MS test from the samples. After that MS test was conducted on the produced samples and the results were evaluated. As a result, it has come in view that RHA can be used as mineral filler in the asphalt concrete.

Keywords: **Asphalt concrete, Rice husk ash ,Flexible pavement, Asphalt mixture, Hot mix asphalt.**

I. INTRODUCTION

Hot mix asphalt (HMA) concrete is a aggregate of aggregate and asphalt cement. The aggregate acts because the structural skeleton of the pavement and the asphalt cement because the glue of the mixture. The mineral aggregate, such as coarse and fine particles in asphalt paving mixtures, encompasses approximately 90% of extent of HMA. The properties of the mixture have direct and significant impact on the performance of asphalt pavements. Asphalt concrete is the maximum usually used fabric in pavement because of its superior service performance in providing using consolation, stability, sturdiness and water resistance.

Highways are as an alternative excessive fee systems, and for this reason, it's far compulsory that the materials to be used for their buildings Need to be appropriately designed. Flexible pavements are designed to be able to have a two decades assignment lifestyles. For that cause, the weight distributions that could occur on those systems must additionally be calculated and included in the layout method. The current studies topics include the studies specializing in growing the overall performance and lifelong of roads. It is aimed to increase the performance and lifelong of roads by way of the use of special additive substances.

Rice husk ash (RHA) is a by-product from the burning of rice husk. Rice husk is extraordinarily conventional in East and South-East Asia due to the rice manufacturing in this location. The rich land and tropical weather make for best situations to cultivate rice and is taken gain by those Asian countries. The husk of the rice is removed within the farming process before it is sold and consumed. As a result of rice production, there's so many rice husk as waste cloth and the regions that there's too much manufacturing, for hold- ing greater area environmental pollutants would happened. Nowadays, there's an increasing interest within the usage of waste substances. In the case of construction industry there was a developing trend closer to the improvement and use of waste as supplementary cementitious substances. The not unusual pozzolanic dealers from industry and agriculture by-products inclusive of fly ash and RHA are getting active regions of research for the reason that now not only do their use leads to diversified product best of the mixed cement concrete, however also leads to reduction in value and bad environ- mental effects.

II. LITERATURE REVIEW:

Satish Chandra et al (September 2011) Stated that marble dust as filler showed higher compressive power, modulus of elasticity and tensile electricity. The behaviour of bituminous concrete with marble dirt filler showed better power fee. This paper reviewed that at low temperature, the tensile electricity of bituminous mixes with marble dirt filler exhibited better values and higher performance can be carried out in bloodless place through the usage of marble dirt as filler. This paper concluded that marble dust, a waste manufactured from marble industries in India, may be successfully and efficaciously utilized in bituminous street production.

Ravindra Tomar et al (November 2013) Said that marshal residences of brick dirt as filler are nearly nearly identical as the ones of traditional fillers along with cement and lime in bituminous mixes. The outcomes showed that bituminous mix containing brick dust as filler displayed maximum stability at a few content of bitumen having an increasing fashion as much as that content after

which steadily reducing. This paper concluded that brick dirt can be used correctly in construction of bitumen concrete mixes for paving purposes in destiny.

Sebnem Sargın , Mehmet Saltan , Nihat Morova , Sercan Serin c, and Serdal Terzi(2013) In this paper examined to practice the rice husk ash (RHA) in the warm blend asphalt as mineral filler. Limestone filler and RHA used. On this research. Samples to be made for marshall stability check and obc was decided. Test consequences have confirmed that combinations that used 50% RHA and 50% LS of (2.5% RHA and a couple of 5% LS) have had the greatest MS when predicted in terms of MS. RHA is locate in preference to limestone filler wherein RHA waste found in massive quantity.

DebashishKar et al(June 2014) Observed that the mixes with fly ash as filler show off lesser properties compared to control mixes and fulfill preferred criteria, consequently it's far encouraged to use fly ash anywhere to be had, which facilitates in lowering the price of execution. This paper concluded that the fly ash can effectively be used as filler in paving mixes in place of maximum usually used fillers and use of fly ash in paving mixes continues the environment secure and easy.

DipuSutradhar et al (2015) Defined that the waste materials like concrete dirt and brick dust are taken into consideration to be less high priced and ample quantity of fabric. This paper referred to that the houses of traditional bituminous mixes containing satisfactory sand with stone dust as fillers have almost identical marshal residences of waste concrete dirt and brick dust as fillers. They discovered that the marshal stability increases with the growth of bitumen content material within the mix, and observed maximum balance for bituminous mixes containing brick dust. They concluded that the outcomes may be good with usage of waste concrete dust and brick dirt as fillers for amendment of design mixes within the bituminous pavement, which allows to keep sizeable investment in construction of pavement and to some extent solving the waste disposals.

Mahyar Arabani et al. (2017) This inspection turned into to exploration the affects of RHA as a mineral filler on warm mix asphlat.Bitumen mixes with 5%, 10%, 15% and 20% RHA modifier. Marshall take a look at changed into carry out in thisinvestigation for mechanical houses to be checked. In this examination RHA could enhancethe balance of blends. However,greater quantity of mineral filler approximately 20% can decrease stabilty cost.

Rocksana Akter, and Md. Kamal Hossain,(2017) This take a look at changed into about evaluate the traditional filler with non traditional filler. Cement, lime and stone dirt are used as conventional fillers and RHA & slag as a non traditional filler in bituminous paving mixes. Mix pattern prepared and evaluate by marshall technique. It became seen that most balance is discovered via rice husk ash observed by stone dust and slag as filler materials.RHA & slag secure choice in bituminous paving mix.

III. MATERIALS &METHODOLOGY

III.I. Materials used

III.I.I. Aggregates

The aggregate are obtained from the locally available crusher. They should have goodcrushing strength, abrasion value, impact value.

Table 1 Physical Tests of Aggregates

Property	Results	As per Specification
Aggregate Crushing test	25.76%	Max 30%
Abrasion test	31.52%	Max 35%
Water absorption	0.352%	1
Specific Gravity	2.79	2.6-2.9
Aggregate Impact value	15.6%	Less than 30

III.I.II. *Bitumen*

It is used as a binding material which is available in different grades.VG30 is used in this project.

Table 2 Tests of Bitumen

Property	Result	As per Specification
Penetration test	53.3	50-70
Ductility test	83cm	Min 75
Softening point test	47	35-70

III.I.III. Filler

The fillers are inert materials which pass 75 micron sieve. Rice Straw Ash is used as filler.

Table 3 Physical Test of Fillers

Property	Result	As per Specification
1) Specific Gravity test	2.25	2.6-2.9
2) Water Absorption test	0.841	1

III.II. *Gradation ofAggregates*

Gradation of aggregates is the main performance in the job mix design. Based on the gradation only the voids obtained by the coarser aggregates are filled by the finer aggregates.

Table 4 Gradation Table.

IS Sieve(mm)	Cumulative % of passing weights
26.5	100
19	79-100
13.2	59-79
9.5	52-72
4.75	35-55
2.36	28-44
1.18	20-34
0.6	15-27
0.3	10-20
0.15	5-13
0.075	2-8

IV. Marshall Stability Test

The first phase in the mix design is the selection and combination of available aggregates to obtain a gradation within the required limits. Available crushed stones were combined together using a trial and error method for gradation design to obtain the specified gradation. The Marshall Mix design procedure as specified in ASTM is to be used for determining the optimum binder content (OBC) that should be used in the mixture to give the proportions of the different materials to be used in producing the conventional hot-mix mixture that satisfies the requirements of the given specifications. The Marshall specimens were prepared by adding different proportions of asphalt (by weight of mix) into the hot aggregate. Three identical specimens for each percentage were fabricated and the average value is reported. The amount required for each specimen is about 1200 g. The volumetric properties were then determined to obtain the optimum binder content, air voids, bulk specific gravity, and stability. Graphs to be plotted for Voids Filled with Bitumen Vs Bitumen Content, Density Vs Bitumen Content, Voids In Mineral Aggregate Vs Bitumen Content, Flow Vs Bitumen Content, Stability Vs Bitumen Content and % Of Air Voids Vs %Bitumen Content.

V. RESULTS AND DISCUSSIONS

AS PER METHODOLOGY THE EXPERIMENTAL INVESTIGATION IS CARRIED BY THE COMBINATION OF AGGREGATES, BITUMEN, AND RICE STRAW ASH 0.30 AS FILLER MATERIAL AT 2% AND 4% TO OBTAIN THE OPTIMUM BITUMEN CONTENT AND THE GRAPHS ARE PLOTTED COMPARED TO CONVENTIONAL MIX.

Table 5 Conventional Mix (0% Filler)

S.No	% of bitumen	Stability value (N)	Flow (mm) Fv	Air voids (%) Vv	Vol of bitumen (%) Vb	VMA (%)	VFB (%)
1	4.5	984	2.4	5.52	9.09	14.60	62.20
2	5	1054	2.6	4.59	10.21	14.55	70.30
3	5.5	1067	3.2	3.12	11.39	14.75	76.80
4	6	954	3.9	2.94	12.40	15.90	85.30

Table 6 3% filler (RSA)

S.No	% of bitumen	Stability value (N)	Flow (mm) Fv	Air voids (%) Vv	Vol of bitumen (%) Vb	VMA (%)	VFB (%)
1	4.5	945	2.5	5.10	9.2	14.10	63.70
2	5	986	2.8	4.30	10.08	14.55	69.55
3	5.5	1048	3.1	3.60	11.05	15.20	75.12
4	6	1089	3.2	4.10	12.30	15.80	79.16

Table 7: 5% filler (RSA)

S.No	% of bitumen	Stability value	Flow (mm) Fv	Air voids (%) Vv	Vol of bitumen (%) Vb	VMA (%)	VFB (%)
1	4.5	926	2.6	4.75	9.05	13.76	65.78
2	5	985	2.90	4.50	10.10	14.62	69.01
3	5.5	1095	2.03	4.65	11.05	15.72	70.35
4	6	1070	3.3	5.05	12	17.03	73.63

Table 8: 7% filler (RSA)

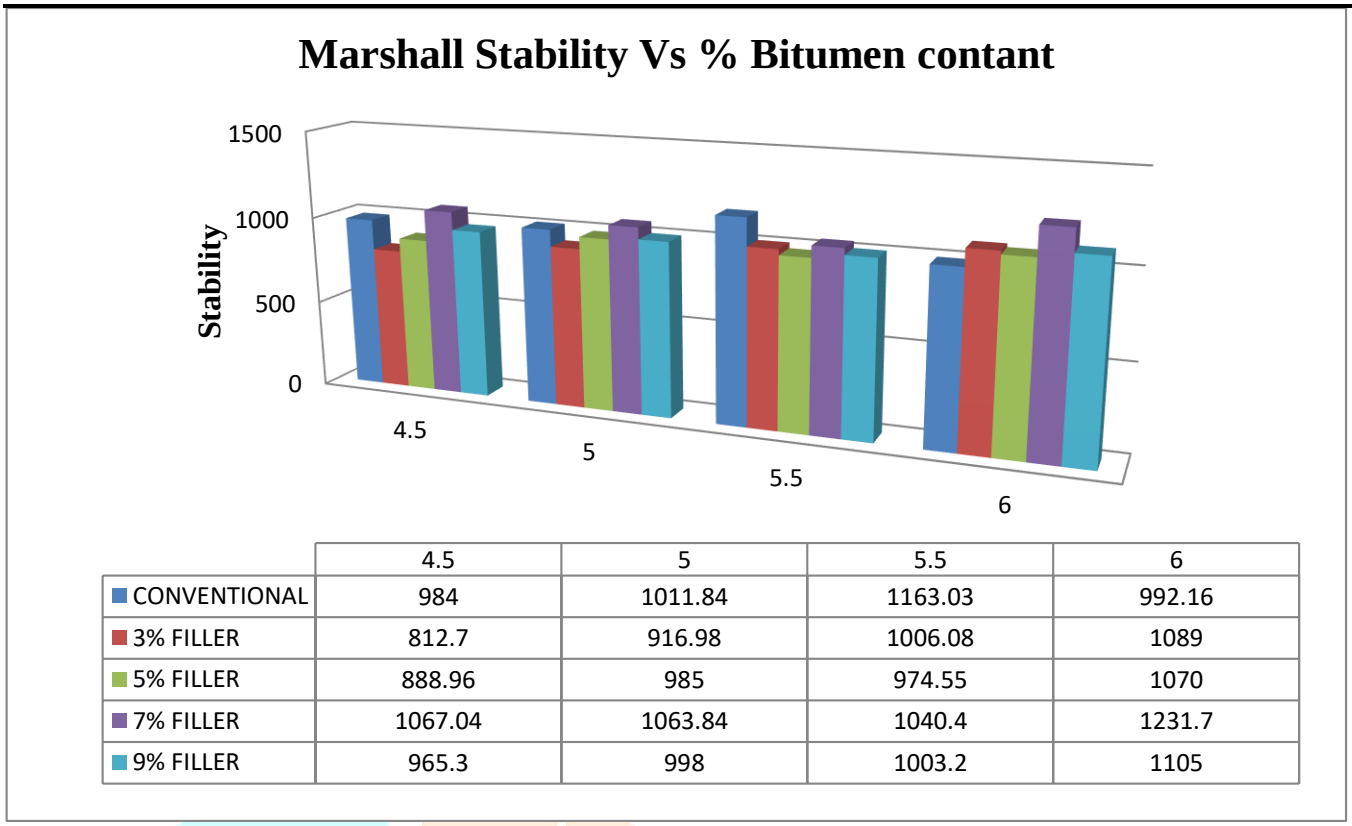
S.No	% of bitumen	Stability value (N)	Flow (mm) Fv	Air voids (%) Vv	Vol of bitumen (%) Vb	VMA (%)	VFB (%)
1	4.5	936	2.80	4.65	10.36	13.69	66.05
2	5	976	2.99	4.85	11.39	14.35	66.20
3	5.5	1020	3.35	5.06	12.27	15.62	67.65
4	6	1090	4.05	5.25	13.30	16.30	69.30

Table 9: 9% filler (RSA)

S.No	% of bitumen	Stability value	Flow (mm) Fv	Air voids (%) Vv	Vol of bitumen (%) Vb	VMA (%)	VFB (%)
1	4.5	985	2.85	4.60	10.45	13.85	67.05
2	5	998	2.95	4.95	10.60	13.95	67.35
3	5.5	1045	3.25	5.15	11.65	14.45	69.58
4	6	1105	3.90	5.35	12.65	15.70	70.05

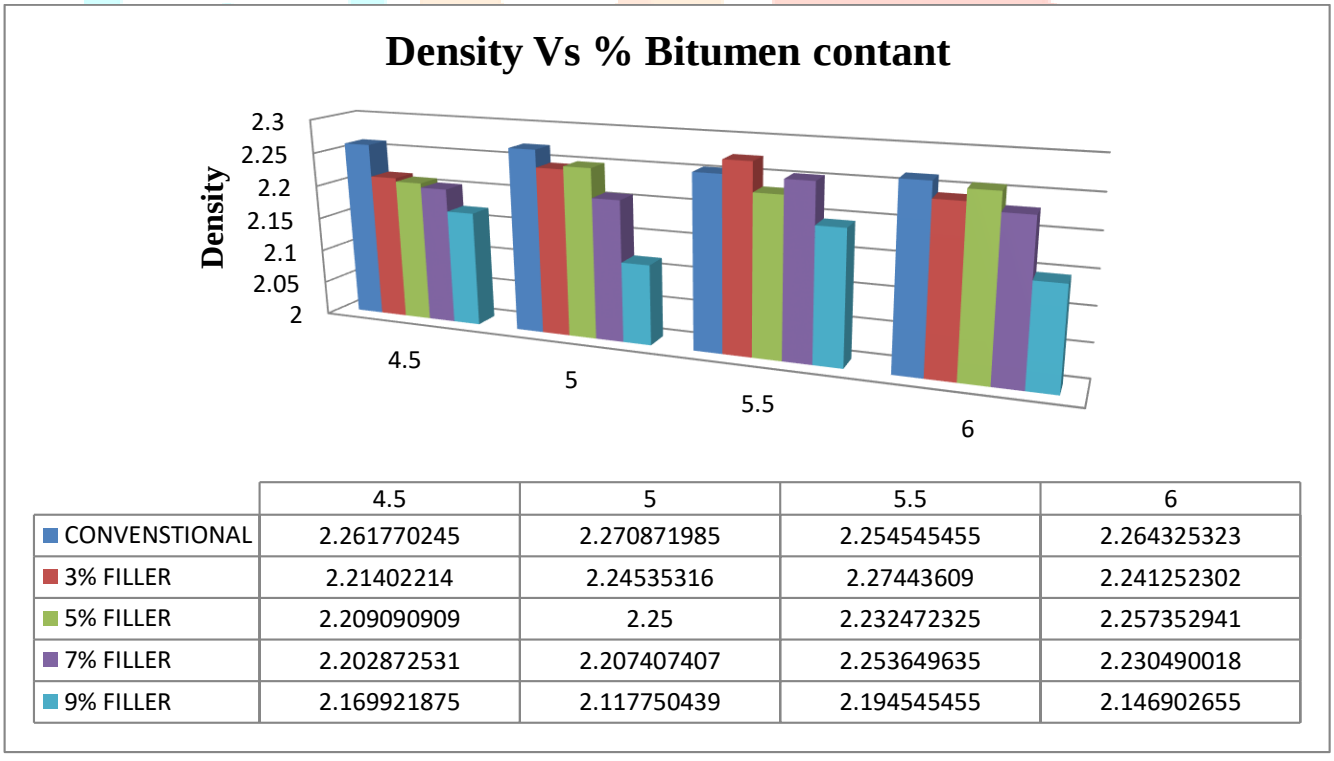
VI. Comparison of Filler Mix with Conventional Mix

It is observed that the stability when compared to conventional mix is almost nearer for both the mixes with filler. The flow values in conventional are lower than 3% and 5% RSA. The bitumen content increases as the air voids percentage increases with addition of filler. The VFB percentage is almost same for conventional and 3% whereas.It is far differ in 5% filler.The VMA percentage is higher for 9% filler mix when compared to conventional and 3% filler mixes.



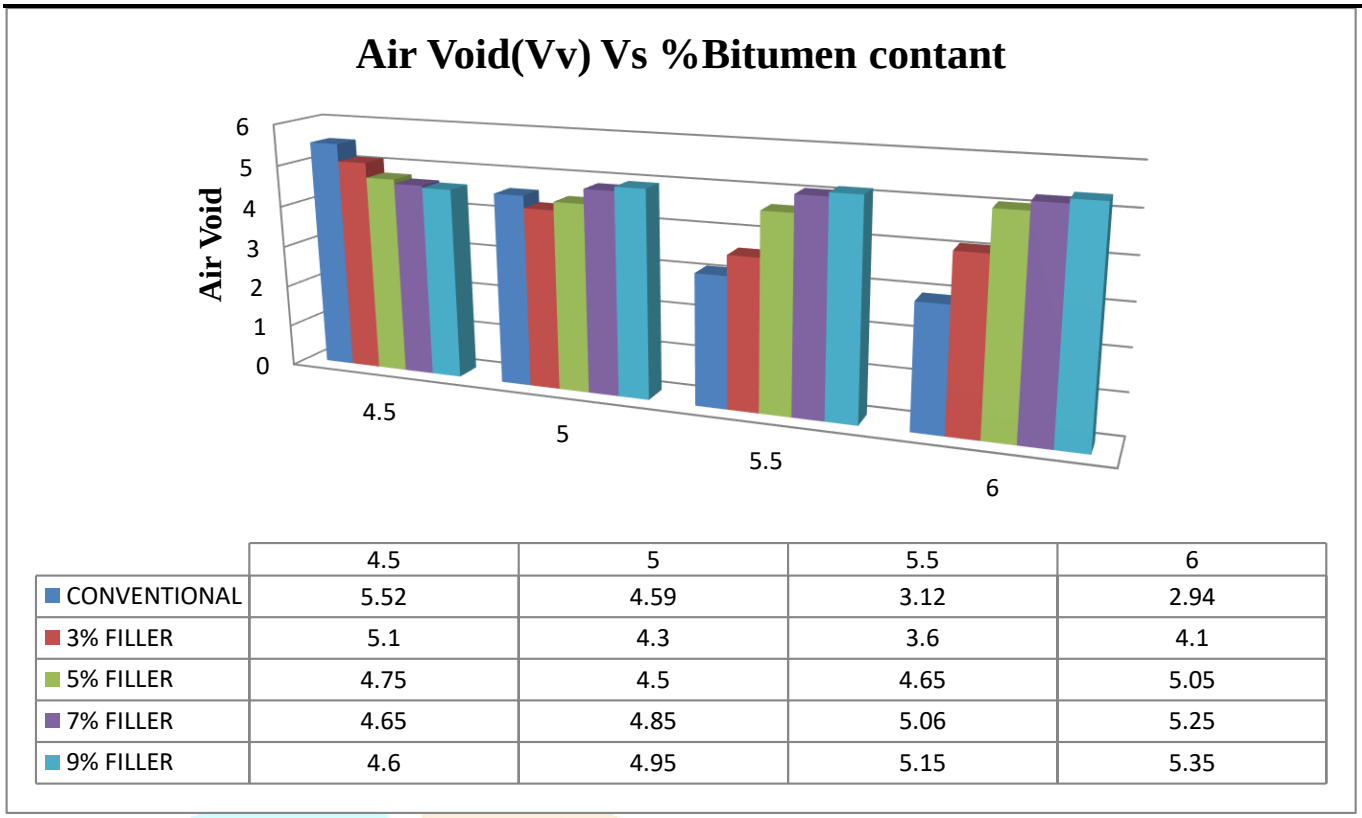
	4.5	5	5.5	6
CONVENTIONAL	984	1011.84	1163.03	992.16
3% FILLER	812.7	916.98	1006.08	1089
5% FILLER	888.96	985	974.55	1070
7% FILLER	1067.04	1063.84	1040.4	1231.7
9% FILLER	965.3	998	1003.2	1105

Figure 1 Marshall Stability Vs % Bitumen contant



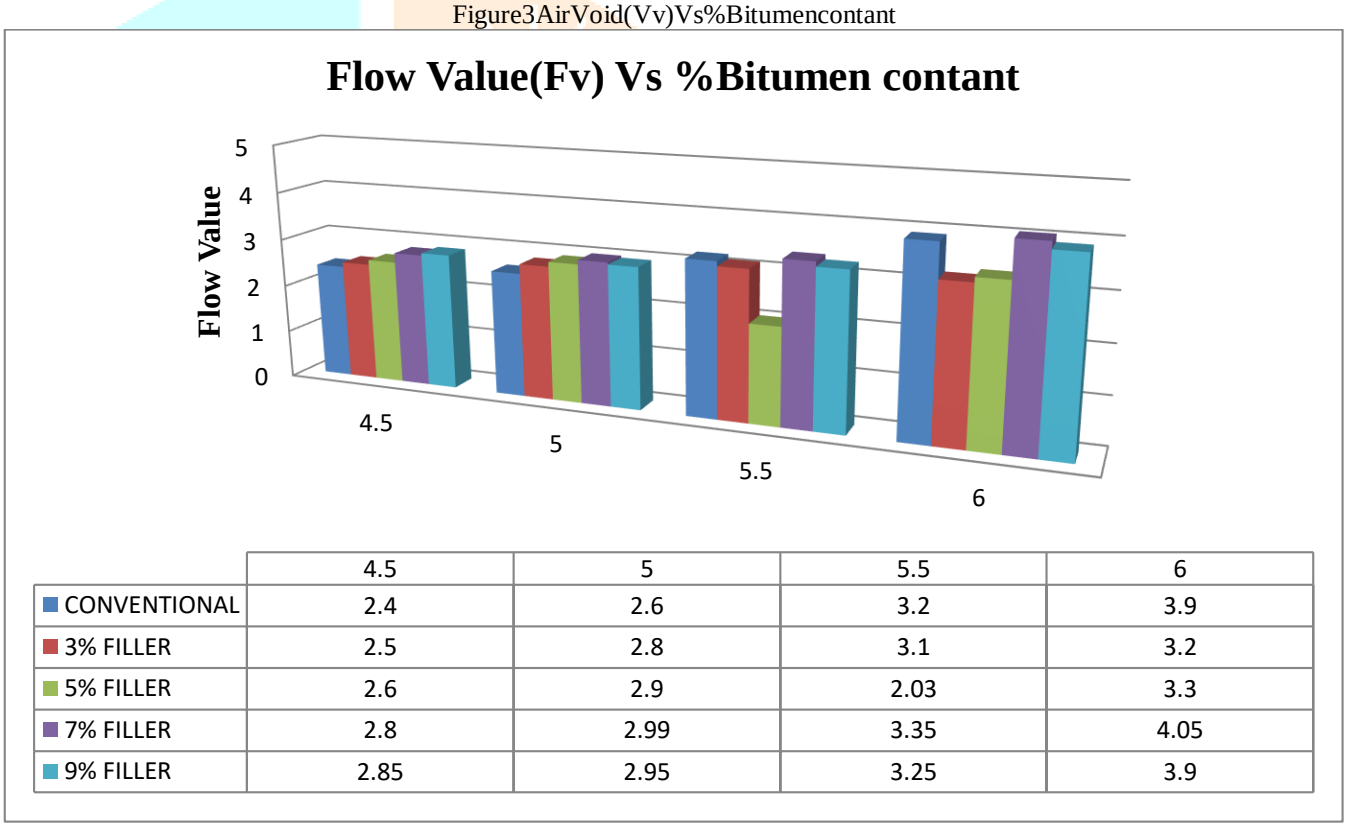
	4.5	5	5.5	6
CONVENSTIONAL	2.261770245	2.270871985	2.254545455	2.264325323
3% FILLER	2.21402214	2.24535316	2.27443609	2.241252302
5% FILLER	2.209090909	2.25	2.232472325	2.257352941
7% FILLER	2.202872531	2.207407407	2.253649635	2.230490018
9% FILLER	2.169921875	2.117750439	2.194545455	2.146902655

Figure 2 Density Vs % Bitumen contant



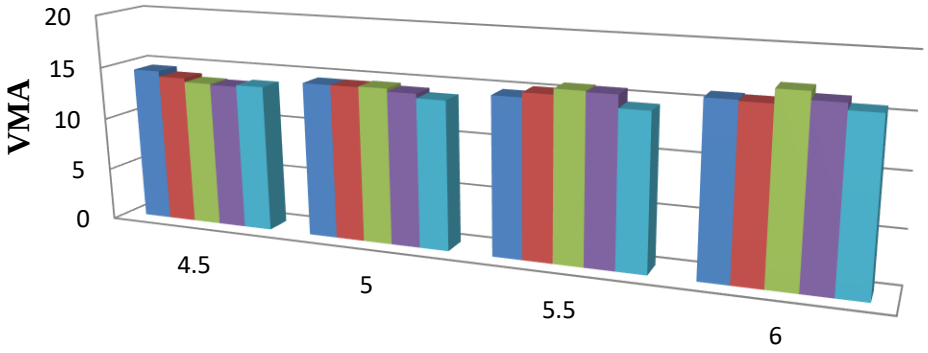
	4.5	5	5.5	6
CONVENTIONAL	5.52	4.59	3.12	2.94
3% FILLER	5.1	4.3	3.6	4.1
5% FILLER	4.75	4.5	4.65	5.05
7% FILLER	4.65	4.85	5.06	5.25
9% FILLER	4.6	4.95	5.15	5.35

Figure3AirVoid(Vv)Vs%Bitumencontant



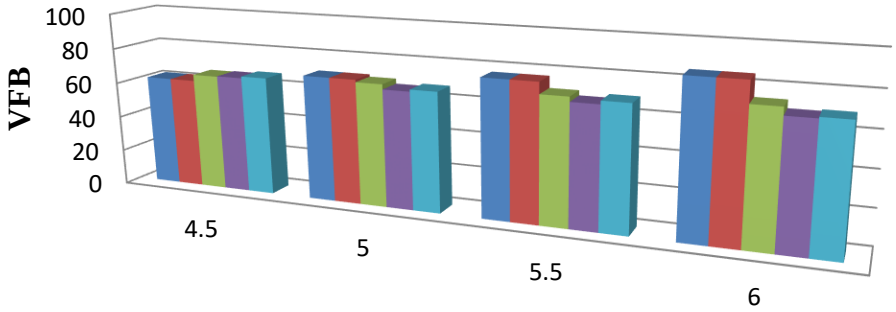
	4.5	5	5.5	6
CONVENTIONAL	2.4	2.6	3.2	3.9
3% FILLER	2.5	2.8	3.1	3.2
5% FILLER	2.6	2.9	2.03	3.3
7% FILLER	2.8	2.99	3.35	4.05
9% FILLER	2.85	2.95	3.25	3.9

Figure 4 Flow Value(Fv) Vs %Bitumen contant



	4.5	5	5.5	6
CONVENTIONAL	14.6	14.55	14.75	15.9
3% FILLER	14.1	14.55	15.2	15.8
5% FILLER	13.76	14.62	15.72	17.03
7% FILLER	13.69	14.35	15.62	16.3
9% FILLER	13.85	13.95	14.45	15.7

Figure 5 Void In Mineral Aggregates(VMA) Vs %Bitumen contant



	4.5	5	5.5	6
CONVENTIONAL	62.2	70.3	76.8	85.3
3% FILLER	62.2	70.3	76.8	85.3
5% FILLER	65.78	69.01	70.35	73.63
7% FILLER	66.05	66.2	67.65	69.3
9% FILLER	67.05	67.35	69.58	70.05

Figure 6 Voids Filled With Bitumen(VFB) Vs %Bitumen contant

VII. CONCLUSION

It is founded that bituminous mixes containing rice straw ash as fillers have nearly identical Marshall Properties as the ones of traditional filler.Rice straw ash is suitable as filler as compared with conventional filler typically used in bituminous blend by using considering the point of economic system and availability. The usage of rice straw ash as fillers in bituminous pavement, with making some adjustments may be used in the destiny which cans shop extensive investment in creation and to a point solving the disposal of wastes to hold eco- friendly environment.

REFERENCES

[1] IRC 37-2001 "Guidelines for the Design of Flexible Pavement"The Indian Roads Congress, New Delhi, 2001.

[2] IS 73: 2013 PAVING BITUMEN — SPECIFICATION

[3] IS 2386-1963: (Part 1-6) "Methods for test on aggregates" The Standard, New Delhi,1963

[4] Ravindra Tomar, R K Jain and M K Kostha , Effect Of Fillers On Bituminous Paving Mixes: International Journal of Engineering Research of Science and Technology, Vol. 2, No. 4, November 2013

[5] Sebnem Sargın et al., "Evaluation of rice husk ash as filler in hot mix asphalt concrete", Construction and Building Materials 48 (2013) 390–397 2013 Published by Elsevier Ltd

[6] DebashishKar, Mahabir Panda And JyotiPrakashGiri, Influence Of Fly-Ash As A Filler In Bituminous Mixes: Arpn Journal Of Engineering And Applied Sciences, Vol. 9, No. 6, June 2014.

[7] DipuSutradhar, MintuMiah, Golam, JilanyChowdhury, Mohd.AbdusSobhan ,Effect of Using Waste Material as Filler in Bituminous MixDesign :American Journal of Civil Engineering 2015; 3(3): 88-94.

[8] Mahyar Arabani et al., "Assessment of mechanical properties of rice husk ash modifiedasphalt mixture",Construction and Building Materials 149 (2017) 350–358, Publishedby Elsevier Ltd

[9] Rocksana Akter, and Md. Kamal Hossain, "Influence of Rice Husk Ash and Slag asFillers in Asphalt Concrete Mixes",American Journal of Engineering Research (AJER) ,Volume-6, Issue-1, pp-303-311, 2017.