

Study on Performance of Modified Binder in Road Construction

R.Srujana,V.Drakshayani, B.G.Rahul, K. HemathaRaja

Abstract:--- Bitumen is most common binding material for construction of flexible pavements. It had been a practice to use bitumen as a binding material as no other material gives such a binding properties. In India, flexible pavement with bituminous surface is widely used because of expanded traffic power of streets, over-burdening of business vehicles and temperature variety of asphalts because of climatic changes prompts arrangement of different bothers like Rutting, Shoving, Bleeding, Cracking and potholing of bituminous surfacing. Because of high temperature bitumen turns out to be very soft in summer and fragile in winter. BIS portrays bitumen as a dull (or) diminish darker non crystalline soil (or) gooey material having sticky material properties gotten from oil grungy either by ordinary (or) by refinery shapes. It is used being developed of boulevards, runways and stages ,waterproofing material for ground surface of handling plants and go downs.In present work , it is proposed to investigate for the behaviour of bituminous mixes prepared with bitumen modified with citric acid. By the comparison of bitumen test with modified bitumen in which climatic conditions the bitumen will be use have to conclude.

Index Terms: BIS,Bitumen, Cracking, Rutting.

I. INTRODUCTION

Bitumen is actually the liquid binder that holds asphalt together. The term bitumen is regularly erroneously used to depict asphalt. A bitumen-fixed street has a layer of bitumen showered and after that secured with a total. This is then reshaped to give a two-coat seal. Asphalt is created in a plant that warms, dries and blends total, bitumen and sand into a composite blend.It is then connected through a clearing machine nearby as a strong material at a selected or required thickness, with respect to the end use. Black-top outcomes in a smoother and more solid surface than a bitumen-fixed street.

An investigation of performance of bitumen is identical grade but varies sciences was conducted to determine if binder performancethis efforts was on performance modified bitumen by using citric acid 2% and 4% of bitumen we have taken. The principle object of this venture is comparison among bitumen and changed bitumen in adjusted bitumen we have chosen citrus acid.

II. METHODOLOGY

A.Material collections:

Revised Manuscript Received on April 09, 2019.

R.Srujana, B.Tech Student, Department of Civil Engineering, K L University, AP, India.

V.Drakshayani, B.Tech Student, Department of Civil Engineering, K L University, AP, India.

B.G.Rahul, Assistant Professor, Department of Civil Engineering, K L University, AP, India.

K. HemathaRaja, Assistant Professor, Department of Civil Engineering, K L University, AP, India.

The material required for the experiments are stated below. The bitumen sample of VG30 grade is chosen to modification process by using citric acid.

B.Bitumen:

It is a semi-solid hydrocarbon product produced by removing the lighter fractions such as liquid petroleum gas, petrol and diesel from heavy crude oil during the refining process. As such, it is correctly known as refined bitumen. In North America, bitumen is commonly known as asphalt. Bitumen is a binding organic material made from the by-products of refined crude oil. We have use 4% to 6% of bitumen,it is used in road construction because it is easy to produce, reusable, non-toxic, and a strong binder.

C.Coarse Aggregate:

Aggregates are the inert materials that are mixed in fixed proportions with a Binding Material to produce concrete. The material retained on 2.36mm sieve and shall be crushed stone.These act as fillers or volume increasing components on the one hand and are responsible for the strength, hardness, and durability of the concrete on the other hand.

D.Citric Acid:

Citrus separate is imperative normal destructive present as most of the way in practically every metabolic respiratory or high-sway cell. Valuable stones of citrus extricate are exhausting and translucent. Citrus remove is possibly efflorescent in warm dry air and hygroscopic in wet air. Citrus separate is inauspicious and taste is determinedly acidic.

E.Mineral Filler:

The requirement of filler in bitumen the material passing 1.18 sieve, in fine aggregate, if any. The filler shall be stone dust, and it fills the voids. In present project filler of 1.18 is used.

III. EXPERIMENTAL WORK

A.Marshall Stability:

First we should take diverse sifter sizes like 19.5mm 10%, 13.5mm 20%, 9.5mm 30%, 4.75mm 10%, 2.36mm 10%, 1.18mm 10% strainers with the total rate and warmth the totals at 1000c .and see the heaviness of the totals in the wake of warming and compute the level of bitumen take the bitumen of 4.5 to 5.5 % and again heat the bitumen of C.

Clean the form with no bitumen in it and void warmed bitumen into the moulds.Tamp the bitumen of 75 blows and



transform the shape into invert course and pack 75 blows keep the form a side for 1 day remove the bitumen from the molds following 1 day. Do the particular gravity test and water ingestion test for the bitumen.

Take the spotless dishes keep the water in one of the bowl and 200ml citrus extract in another bowl and water keep the one of the shape in ordinary water and another form in citrus extract and another shape in cooler for one day.



Fig. 1 Marshall stability test Sample testing

IV. RESULTS AND DISCUSSION

Various tests conducted on modified bitumen and results are as follows:

A. Bitumen Penetration Test:

It measure the hardness (or) softness of bitumen by measuring the depth in tenths of millimetre to which a standard loaded needled is in vertical direction it falls within 5seconds.the test was conducted by using penetrometer.

Bitumen Grade	Dosage (% w/w)	Bitumen(mm)
VG30	0	60
	0.5	41
	1	40
	1.5	31
	2	28

B. Softening Point Test:

The softening point test is a test is also called as Ring and Ball test to determine the temperature at which binder achieves a specified degree of viscosity. In this test the steel ball is placed on disc of the bitumen that slowly move down when temperature increases and ball to fall about 25mm.

Bitumen Sample	Dosage (% w/w)	Softening Temperature(°C)
VG30	0	40
	0.5	43
	1	44
	1.5	49
	2	53

C. Ductility Test:

The Ductility test is performed for deciding the ductility of bituminous material by estimating the stretching before breaking. When two end of briquette specimen are pulled separated at aspecified speed and temperature. The test was conducted at 25°C.

Bitumen Sample	Dosage (% w/w)	Ductility Value (cm)
VG30	0	100
	0.5	83
	1	72
	1.5	61
	2	56

D. Marshall Stability Test:

Marshall Stability test was conducted to determine the stability and flow values of the bituminous mix samples.

Bitumen (%)	Stability Value (KN)	Flow(mm)
4	13.51	3
5.5	14.85	3
6	13.75	4

V. DISCUSSION

By increasing the percentage of modifier bitumen becomes hard. In view of that reason the value of penetration and softening point are increasing with dosage of modifier upto 2%. Ductility of bitumen is seen to be near the permissible value.

VI. CONCLUSION

Analysis on modified binder can minimise the quantity of bitumen used in construction of road. Properties of bitumen such as penetration and softening point are greatly enhanced. Hardness of bitumen is observed to be increasing.Ductility of bitumen is observed to be close to the value. Modified binder are and when it is used in hot weather preferability for semi dense bituminous concrete.By chance if there is any acid exposure of bitumen there will not be much difference of the bitumen.



VII. FUTURE SCOPE

Study on usage of modified binder for different additives used in modification of binder can be studied.

REFERENCES

1. Laya, R. V. R., Jyothsna, B., Rahul, B. G., & Hemanth Raja, K. (2017). Flexible pavement evaluation and overlay design. *International Journal of Civil Engineering and Technology*, 8(4), 1462-1470.
2. Mario Neelkamal, S., & Hemantha Raja, K. (2017). Design of flexible pavements by using geo grids geo cells and geo membranes. *International Journal of Civil Engineering and Technology*, 8(4), 2226-2229.
3. Pradeep Reddy, G., Tarun Krishna, G., Hemantha Raja, K., & Shahabas, S. (2017). Design of polyester (recron-3S) fiber reinforced flexible pavement. *International Journal of Civil Engineering and Technology*, 8(4), 1231-1237.
4. Sai Venkatesh, N., Praveen Reddy, M., Hemantha Raja, K., & Sai Ranga Rao, M. L. (2017). Evaluation of recycled aggregates & fly ash used in flexible pavements: A model study. *International Journal of Civil Engineering and Technology*, 8(4), 958-964.
5. Sambaturu, S. B., Surendra, Y. L., Nagaseshu Babu, T., Hemantha Raja, K., & Asadi, S. S. (2017). Usage of waste materials in pavement construction with replacement of conventional materials. *International Journal of Civil Engineering and Technology*, 8(4), 1305-1312.
6. Satish, S., Koganti, S. P., Raja, K. H., & Sai, K. R. (2018). Stabilization of black cotton soil by using cement, lime and rice husk in flexible pavements. *International Journal of Engineering and Technology (UAE)*, 7(2), 24-27. doi:10.14419/ijet.v7i2.1.9877
7. Shyam Prakash Koganti, Kommineni Hemanthraja, Satish Sajja "Replacement of Fine Aggregate by using Recyclable Materials in Paving Blocks", *IOP Conf. Series: Materials Science and Engineering* 225(2017)
8. Siva Teja, A., Keshav Prasad, K., Rahul, B. G., & Hemantha Raja, K. (2017). Performance evolution of bituminous mixes using coir geotextiles. *International Journal of Civil Engineering and Technology*, 8(4), 1068-1073.
9. Sri Harsha, K., Nikhil, M., & Hemantha Raja, K. (2017). Partial replacement of bitumen with glass fiber in flexible pavement. *International Journal of Civil Engineering and Technology*, 8(4), 1176-1181.
10. Sunil, K., Sahithi, K., Reshma, T., & Hemanth Raja, K. (2017). Use of industrial wastes in the construction of flexible pavements. *International Journal of Civil Engineering and Technology*, 8(4), 1117-1122.
11. Syiemiong, M.K., Verma, R., Rahul, B.G., Sri Harsha, G. Effects of acids and bases contamination on soil properties in pavement construction *International Journal of Civil Engineering and Technology* 8(4), pp. 1595-1602
12. Rushendrareddy, V., Surendra, T., Rahul, B. Use of waste plastic in flexible pavements *International Journal of Civil Engineering and Technology* 8(5), pp. 350-356
13. Reddy, M.M., Reddy, K.R.S., Asadi, S.S., 2018. A study on compressive strength of conventional concrete by replacing with flyash and sugarcane ash. *International Journal of Pure and Applied Mathematics*, 119 (14), pp. 1787-1791.
14. Sajja Satish, Shyam Prakash Koganti, Kommineni Hemantha Raja "Stabilization of black cotton soil by using cement, lime and rice husk in flexible pavements" *International Journal of Engineering & Technology* 7 (2.1) (2018) 24-27
15. Reddy, V.S.G. and Rao, V.R., 2017. Eco-friendly blocks by blended materials. *International Journal of Engineering*, 30(5), pp.636-642.

AUTHOR PROFILE



Pursuing my B-Tech degree in civil engineering at koneru lakshmaiah education foundation (Vijayawada). She actively participate in workshops, seminars. In around of university.



Pursuing my B-Tech degree in civil engineering at koneru lakshmaiah education foundation (Vijayawada). She actively participate in workshops, seminars. In around of university.



B.G.Rahul working as assistant professor in Department of Civil Engineering at KLEF since November 2012. He completed his B-Tech in Civil Engineering from KLCF, Guntur and Andhra Pradesh. M-Tech in transportation engineering from JNTUCEH Telangana State. He published 8(eight) research articles in international and National referred journals. He actively organized conferences, workshops and guest Lectures in the Department of Civil Engineering in KLEF.



K.HemathaRaja Department of Civil Engineering at KLEF since June 2012. He completed his B-Tech in Civil Engineering from V Rao Siddhartha College of Education, Guntur and Andhra Pradesh. M-Tech in transportation engineering from NIT Warangal Telangana State. He published 16(Sixteen) research articles in international and National referred journals. He actively organized conferences, workshops and guest Lectures in the Department of Civil Engineering in KLEF.