EXPERIMENTAL INVESTIGATION ON SELF HEALING FLEXIBLE PAVEMENT USING CRUMB RUBBER

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ABSTRACT

Use of Crumb Rubber i.e. the rubber obtained from the waste tires of vehicles in the construction of flexible pavement is gaining importance. It is also worth mentioning that, the modifier raw-material has been sourced from disposed crumb rubber.

This not only allows us to collect modifier raw material at low cost, but also provides a solution towards ecological menace posed by increased use of rubber. In the present study, an attempt has been made to use Crumb Rubber, blended using wet process Marshal method of Bituminous mix design was carried out for varying percentages of Crumb Rubber to determine the different mix design characteristics. We referred the code book IS1202-1989 to determine the specific gravity.

We have used this crumb rubber with bitumen for improved characteristics when compared with straight run bitumen and improve the strength of pavement Modified Bitumen is one of the important construction materials for flexible pavements. A bacteria named BACILLUS SUBTILIS is included for automatic closure of cracks in pavements.

Keywords: Crumb rubber, Wet process, flexible pavements.

I.INTRODUCTION

GENERAL

Bitumen is a black or dark colored solid or viscous cementations substances consists chiefly high molecular weight hydrocarbons derived from distillation of petroleum or natural asphalt, has adhesive properties, and is soluble in carbon disulphide.

As it is estimated that about 60% of waste tires causes land pollution in both urban and

rural areas and per capita land is decreasing in India due to this hazardous waste, it is either land filled or incinerated which cause land and air pollution if this waste is mixed in to bitumen to improve the quality of road it would prove itself as an eco-friendly characteristics.

By using the waste Crumb Rubber as a modifier the properties of bitumen will be change and this change in physical properties like softening point, penetration value, elastic recovery and Marshall stability was checked by different test. In this study we used modifier in proportion 8%, 10%, 12% and 14% by the weight of VG-30 bitumen.

SELF HEALING CONCRETE

- **Self-healing concrete** is a product that will biologically produce limestone to **heal** cracks that appear on the surface of **concrete** structures. ... These **self-healing** agents can lie dormant within the **concrete** for up to 200 years.
- Tiny cracks in concrete do not necessarily affect structural integrity in the short term, but they do allow water and other chemicals to seep into the structure, which may cause problems over time. Self-healing concrete has embedded clay particles that contain dormant bacteria and a food source. When a crack appears in the concrete, water seeps in and activates the bacteria. When they wake, the bacteria eat their packed lunch and then conveniently excrete chalk, which fills the crack.

BACILLUS SUBTILIS BACTERIUM

- Bacillus subtilis (B. subtilis) is a Gram-positive, aerobic bacterium. It is rod-shaped and catalase-positive. B. subtilis is found in soil and the gastrointestinal tract of ruminants and humans.
- Bacillus subtilis, known also as the hay bacillus or grass bacillus, is a Gram-positive, catalase-positive bacterium, found in soil and the gastrointestinal tract of ruminants and humans. A member of the genus, Bacillus, B. subtilis is rod-shaped, and can form a tough, protective endospore, allowing it to tolerate extreme environmental conditions. B. subtilis has historically been classified as an obligate aerobe, though evidence exists that it is a facultative anaerobe. B. subtilis is considered the best studied Gram-positive bacterium and a model organism to study bacterial chromosome replication and cell differentiation. It is one of the bacterial champions in secreted enzyme production and used on an industrial scale by biotechnology companies.

CRUMB RUBBER

- **Crumb rubber** is a term usually applied to **recycled rubber** from automotive and truck scrap tires. There are two major technologies for producing **crumb rubber** - ambient mechanical ... Please give me project full **details.**
- We can be provide **Crumb Rubber,** powder of the rubber manufactured from used tires and scraps. Our Crumb Rubber Tier is of high performance and quality. We supply crumb rubber in specified size of 80 mesh, 60 mesh, 40 mesh and 30 mesh. Our Crumb Rubber is commonly used in the manufacturing of Tyros , Automobile Parts, Footwear, Rubber Tiles and different packaging options.

Bacteria With crumb rubber %		Penetration	Softening	Ductility	Viscosity (sec)
1%	0%	85.5	40	60	4200
	3%	80.5	40.5	46	4800
	4%	76	41	43	5200
	5%	71	41.2	38	5600
2%	0%	78.6	41	56	4300
	3%	72	41.2	43	4700
	4%	73.4	41.4	39	5300
	5%	70.2	41.6	36	5700

STANDARD TEST CONDUCTED ON BINDER.

PenitrationTest(IS 1203-1978)

The penetration test determines the hardness or softness of bitumen by measuring the depth in tenths of an mm to which a standard loaded needle will penetrate vertically in 5seconds.

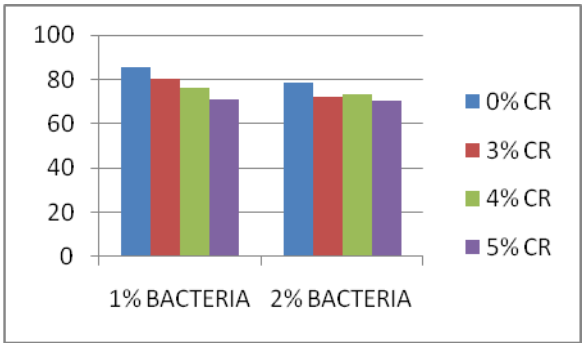
DuctilityTest(IS 1208-1978)

The ductility is expressed as the distance in centimeters to which a standard briquette of bitumen can be stretched before the thread breaks. The test is conducted at 27 c and at a rate of pull of 50mm per minute.

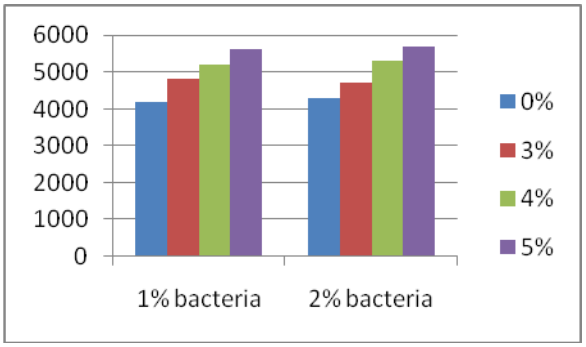
Softening Test (IS 1205-1978)

The softening point is the temperature at which the substance attains a particular degree of softening under specified condition of test. The temperature at which the softening bitumen touches the metal plate at a specified distance below the ring is noted as softening point of bitumen.

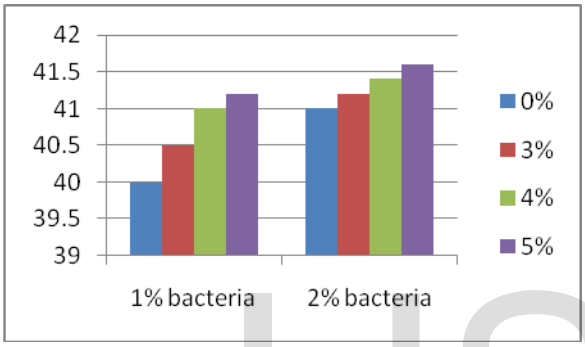
RESULTS & DISCUSSION



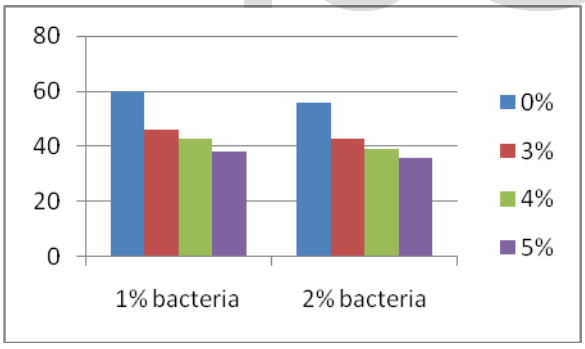
Penetration Test



Viscosity (sec)



Softening Point Test



Ductility Test

CONCULSION.

1. Penetration value of the mix decrease with increase in bacteria % and increase in crumb rubber.
2. Softening point value of mix is increase with increase in bacteria % and increase in crumb rubber.
3. Ductility value of the mix is decrease with increase in bacteria % and increase in crumb rubber.
4. Viscosity value is increase with increase in bacteria % and increase in crumb rubber.

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