

Revolutionizing Road Infra with Modern Equipment, Technologies, Sustainable Materials and Policy Guidelines

February 29th - March 1st, 2024, Manekshaw Centre, New Delhi

**Use of sugarcane molasses for production of bio-bitumen:
Promoting sustainability in road construction**

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India Chapter**

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Problem Statement

- India imports **more than 35%** of its bitumen demand.
- This heavy demand, coupled with fluctuating prices, prompts researchers to look for **other alternatives**.
- One promising future in this direction is the utilization of **bio-binders**.
- Bio-bitumen/bio-binders are prepared by **partially substituting the bitumen with bio-oils** derived from processing of bio-mass.
- **Variability in production, lower yield, huge cost of initial setup, large requirement of energy, etc.** are some of the challenges associated with bio-oils.
- Therefore, these issues demand the utilization of waste materials **that can be used directly** as a partial replacement of bitumen.
- One such innovative waste material is **sugarcane molasses (SM)**.
- SM is a honey like viscous syrup, which is obtained as a **by-product of sugar refining process**.
- India is **second largest producer of sugarcane** behind Brazil.



BACKGROUND

The Horsham Times 1939

Literature compiled by US Transport Department

Ohio State, 1895

MOLASSES AS ROAD PAVING.

For two years India has been trying out a section of road built with molasses, and the Imperial Institute of Sugar Technology at Cawnpore states that it has satisfactorily withstood heavy traffic over that period. The molasses, of course, is used as a paying element, and in sugar-producing countries is readily available. The advantages claimed for it are that it is easily applied, does not melt in summer, does not wear under heavy traffic, and is cheap. The process of manufacturing the composition consists of carrying out the resinification of the molasses with a mixture of coal tar and asphalt in the presence of an agent such as sulphuric acid. The carbohydrates contained in molasses are said to combine with the phenolic bodies of the asphalt and coal tar to form a resinified compound perfectly insoluble in water. The surface of the molasses paving is sealed with a liquid mixture, in the proportion of 1 lb of molasses compound to one gallon of coal tar. The cost of preparing

More cold-mix surfaces for Texas: an explanation of how the Lone Star state is surfacing and repairing many of its black-top roads, by W. J. Stubblefield, p. 20-21, 32.

ENGINEERING, V. 146, No. 3790, September 2, 1938.

The National physical laboratory, metrology department, p. 266-67. (Engineering gauge and line standards. To be continued.)

ENGINEERING, V. 146, No. 3791, September 9, 1938.

The tensile stresses in a bearing metal cast on to a strip and the "fatigue" failure of bearings, by F. C. Thompson, A. S. Keneford, and G. C. Songer, p. 295. (Concluded from p. 236.)

The tensile stresses in a bearing metal cast on to a strip and the "fatigue" failure of bearings; letter from J. Dick, p. 299.

Solid fuel for motor transport, by G. E. Fowell, p. 299-300.

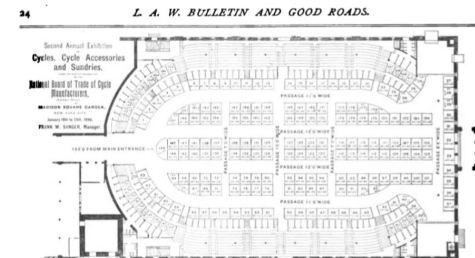
10-cubic yard per hour continuous concrete mixer, p. 313.

The trend of instrument design, by C. C. Mason, p. 317-20.

The use of molasses as a road-making material, p. 321. (Imperial institute of sugar technology at Cawnpore, India, engaged in experiments for converting molasses into insoluble viscous product suitable for use as road-surfacing material. Resinification of molasses carried out with mixture of coal tar and asphalt in presence of agent such as sulphuric acid. Trial length of road, 100 yards long by 10 ft. 6 in. wide, laid at Cawnpore, successfully withstands heavy traffic of cane season, and passes through two rainy seasons successful. Estimated that cost of preparing molasses composition is about Rs. 45-12 per ton, and cost of laying Rs. 0-10, as against Rs. 0-15 for tar macadam, and Rs. 9-10 for concrete road, per square yard.)

ENGINEERING, V. 146, No. 3792, September 16, 1938.

Unit-construction footbridge over Western avenue at Greenford, p. 342-43. (Bridge, which is located 100 yards east of railway over-bridge at South Greenford, Middlesex, has span of 80 ft. and crosses carriage way, cycle tracks and footpaths at right angles.)



The above is a floor plan of the great Madison Square bicycle show which will take place in New York in January (18th to 25th). This exhibition of cycles and kindred subjects will be held under the auspices of the National Board of Trade of cycle manufacturers.

Applications for space should be made to Frank W. Sanger, Madison Square Garden, New York.

TRADE NOTES

"THE 20TH CENTURY HEAD-LIGHT."

Before being aware of the mistake, The Betts Patent Head-Light Co. sent out last week, from the first of those manufactured, some lanterns which were defective. They have gone in different directions, and the company do not know how many were so, or who received them.

Any one having a lantern of this make, which for any reason does not work satisfactory on the bicycle, no matter from what source they obtained it, if they will return by mail or otherwise to the company's office, 10 Warren street, New York, other lanterns which are all right will be sent in place of them, and the company will be glad to make the exchange. A proper lamp of this make will not go out, nor splutter on, and it gives a great light.

MOLASSES AS A PAVING MATERIAL.

The youngster who has cried to have molasses on his roads will no longer rue the day when he and regret to learn that his favorite "sweetmeat" is to become useful as a material for making roads. The experiment is being tried at Chino, California.

An exchange talks of the new pavement as follows:

"It is made mostly of molasses, and if it proves all of the success claimed for it, it may point a way for the sugar planters of the south to profitably dispose of the millions of gallons of useless molasses which they are said to have on hand. The head chemist of a sugar factory at Chino, Mr. E. Turke, was led to make certain experiments, of which the new sidewalk, a thousand feet long, from the factory to the main street, is the result. The molasses used is a refuse product, hitherto believed to be of no value. It is simply mixed with a certain kind of sand to about the consistency of asphalt and laid like an asphalt pavement. The composition dries quickly and becomes quite hard, and remains so. The peculiar point of it is that the sun only makes it drier and harder, instead of softening it, as might be expected. A block of the composition, two feet long, a foot wide, and one inch thick, was submitted to severe tests and stood them well. Laid with an inch or so of its edges resting on supports, it withstood repeated blows of a machine hammer without showing any effects of cracking or bending."

HORSE SENSE SET TO MUSIC.

A correspondent sends us some notes to go with the piece entitled "Horse Sense," which appeared in this paper July 26 and suggests that it would be a first-rate Good Road song. We often feel that if some of these road truths could be set to music and sung in place of some of the present "cantants," it would, perhaps, be a good thing.

We are not just now ready, however, to start a line of highway tunes, much as we see the need of them.

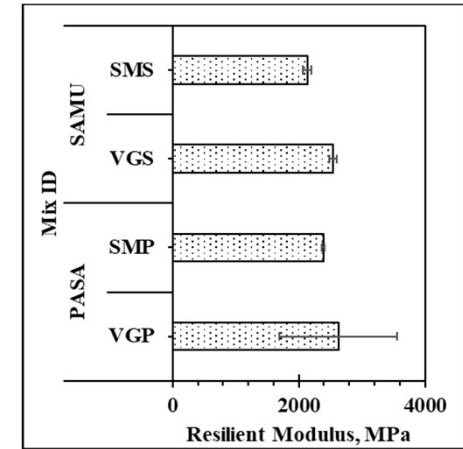
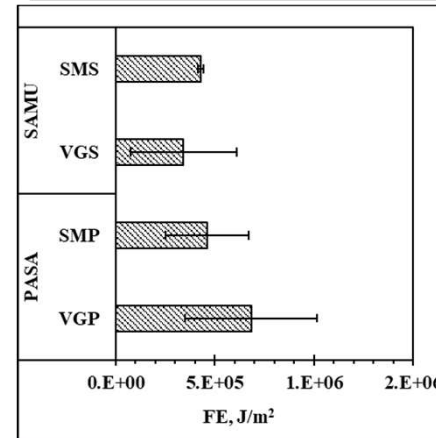
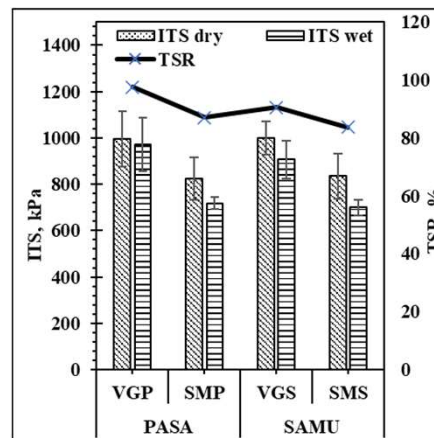
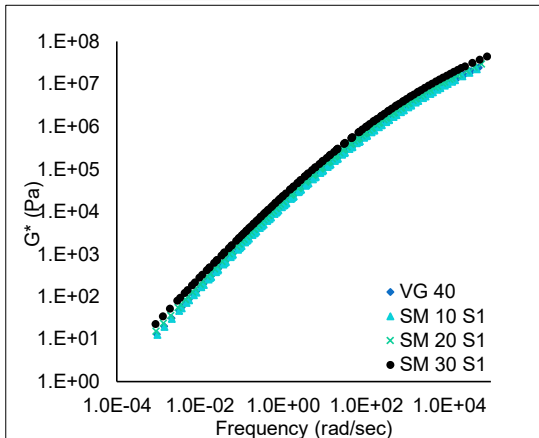
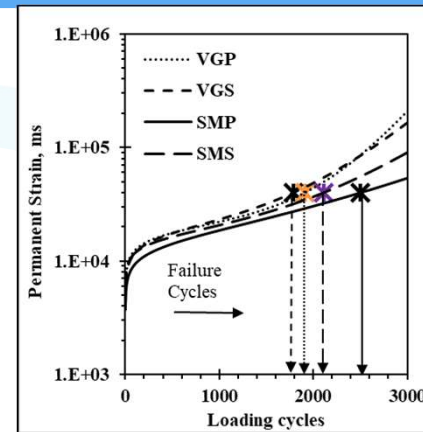
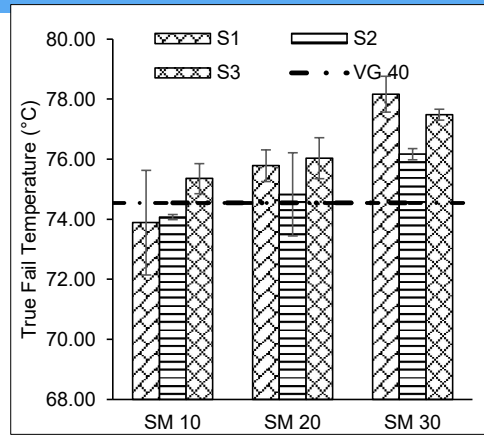
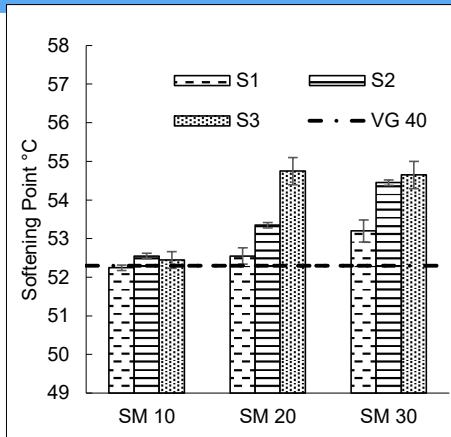


INNOVATION

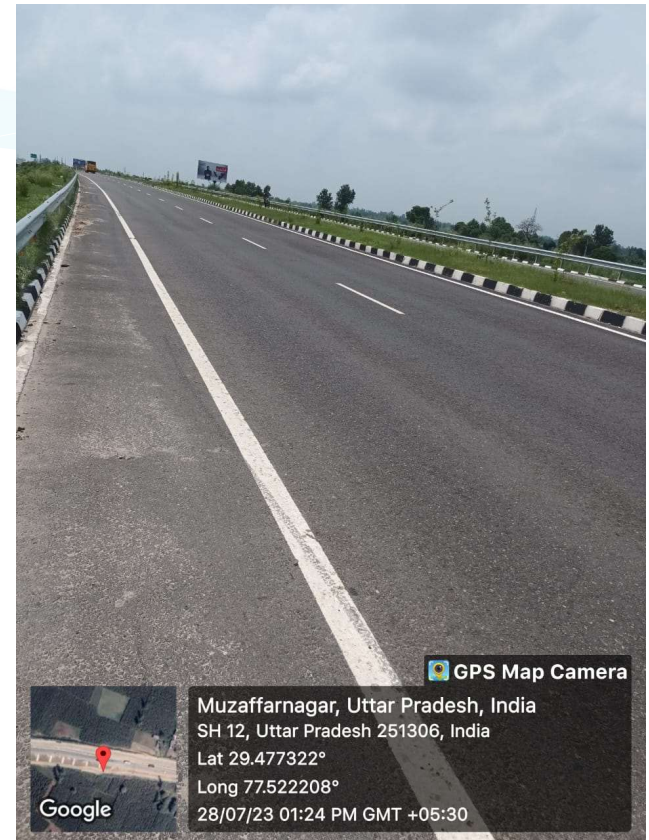


- **25-30%** replacement possible.
- The innovative bio-bitumen **DOESNOT** dissolve in water- Stable under the action of moisture.
- **Chemical interaction-** phenolic group of asphalt interact with carbohydrates in SM- Leads to **RESINIFICATION**.
- **Stiffness** is equivalent to the base binder.
- **20°C-30°C** reduction in production temperatures.
- **15%-20% cost saving** per km of road

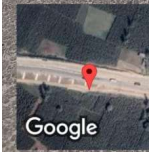
PERFORMANCE AND IMPLEMENTATION



PERFORMANCE AND IMPLEMENTATION



GPS Map Camera



Muzaffarnagar, Uttar Pradesh, India
SH 12, Uttar Pradesh 251306, India
Lat 29.477322°
Long 77.522208°
28/07/23 01:24 PM GMT +05:30

NH-709 AD

Muzaffarnagar Shamli –
200 msa design traffic

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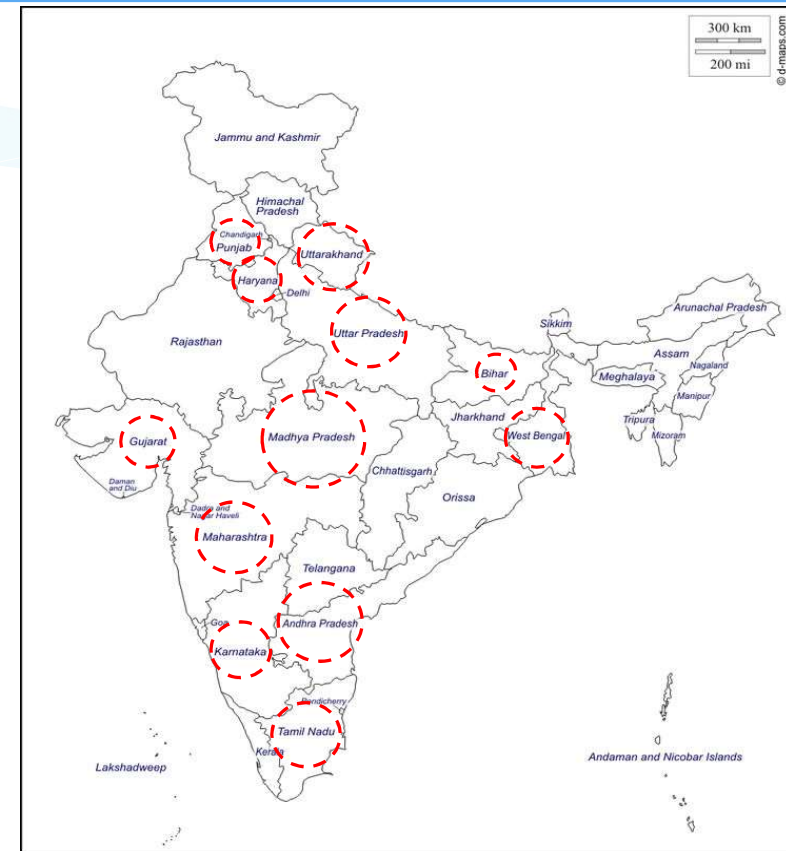
FUTURE

Ethanol

- 1 tonne Sugarcane → 45 kg Molasses (C) → 10.6 litres ethanol (~ **18% yield**).
- Profit incurred → 10.6×445 → Rs 445 – Production cost → **Rs 339 (approx.)**.
- Profit per kg of molasses → Rs 7.5 (**Rs 7500 per tonne molasses**)

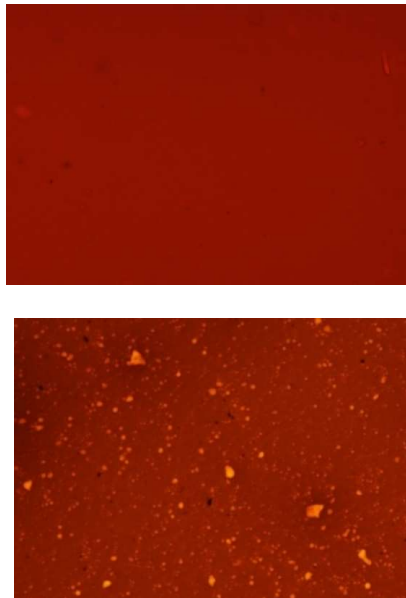
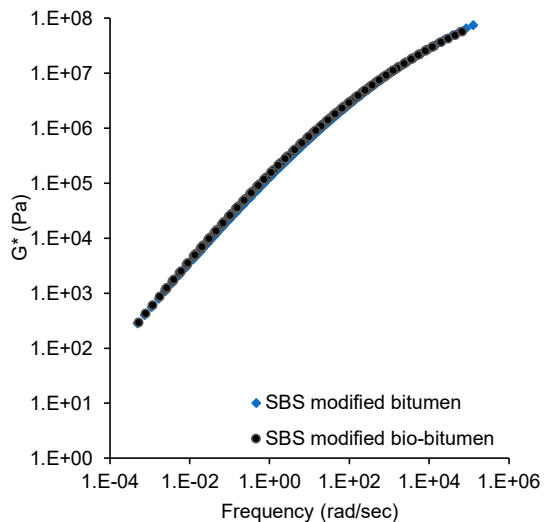
Bio-bitumen

- 45 kg molasses → 45 kg in bitumen (**100% use**)
- Cost per tonne of bio bitumen with 30% replacement → $\text{Rs } 55000 * 0.70 + \text{Rs } 20000 * 0.3$ → Rs 44500 (**19% savings**)
- Per lane per km per 100 mm bituminous layer → 40 tonne bitumen required → 28 tonne (conventional) + 12 tonne SM (30% replacement).
- Molasses production in 2018-19 → 137.88 lakh tonne
- Length of road which can be constructed with only 1% diversion → $137880/12$ → **11,490 lane km** of 100 mm thick bituminous layer.



FUTURE

- IIT Roorkee has now developed SBS-modified bio-bitumen using SM.
- The cost of bio-PMB will be equivalent to the price of conventional bitumen- **Or even Cheaper !!**



Are you willing to use this technology and bring sustainability?

[Contact us](#)

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Thank You

