

Experimental Investigation of Coir Geotextile in Bitumen for Flexible Pavement Construction

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Abstract- It is a major and critical problem with us that the temperature of earth is increasing day by day very rapidly and one of the factors behind this is the heat radiating off roadways. In the summer it absorbs a great deal of heat, warming the roads up to 80 degrees or more and causing many problems such as Stripping, Rutting, and Settlement etc. This project stimulates recovery of thermal energy, stored then supplies it to road and traffic-related facilities and to control the thermal energy of road pavements at the same time. There is continuous increase in temperature in all pipes used in this research. This indicated the impact of temperature on pavement.

Keywords- Geotextile, Bitumen, Flexible Pavement

I. INTRODUCTION

It's a challenge with us to recover this thermal energy and supply it to road and traffic-related facilities with energy and to control the thermal energy of road pavements at the same time. Beside that the pavements are also affected in winter, during rainfall and in day-night due to variation in temperature or thermal impact on pavements layers. Therefore in this project, use the heat which is permanently collected by solar radiation - free energy that slips away because of uncontrolled exchange with the environment through air and soil [1]. The fact is that road infrastructure literally has to perform in the open air. Consequently, these constructions are exposed to a range of weather conditions leading to a variety of thermal conditions for the road structure and hence to a variety of Problems/conditions for the road drivers. These temperature changes between air and structures take place in a completely uncontrolled way and surprise road authorities and contractors again and again. Better control of the thermal condition on pavements will improve the safety, reliability and sustainability of the road networks. The fact is that roads and pavement constructions literally have to perform in the open air. Consequently, these constructions are exposed to a range of weather conditions leading to a variety of thermal conditions for the road structure and hence to a variety of Problems/conditions for the road drivers. These temperature changes between air and structures take place in a completely uncontrolled way and surprise road authorities and contractors again and again. Better control of the thermal condition on pavements will improve the safety, reliability and sustainability of the road networks. The purpose of our project entitled "Experimental Study of Green Road Concept by Controlling Energy of Pavement" is to study the Recovery and controlling of thermal energy of pavement. The significance of this project is to develop sustainable energy harvesting technologies for

thermal impact of pavement. This project stimulates recovery of thermal energy, stored then supplies it to road and traffic-related facilities and to control the thermal energy of road pavements at the same time. This will be achieved by Asphalt solar collectors combined with water filled pipes and Thermo-electrical generators. The annual loss of life of hundreds of car drivers in accidents caused by sudden changes in road surface conditions as a result of changing weather conditions justifies investment in this field of research. Better control of the thermal conditions of road surfaces can help reduce the number of accidents. However fewer the accidents less the downtime of road networks. The results will help us to decrease the deterioration of layers of road surface, which will be beneficial for us and country from the economic and safety point of view.

II. METHODOLOGY

The fact is that roads and pavement constructions literally have to perform in the open air. Consequently, these constructions are exposed to a range of weather conditions leading to a variety of thermal conditions for the road structure and hence to a variety of Problems/conditions for the road drivers. In summer, the structures are permanently collecting heat from solar radiation which makes pavements specially asphalt pavements particularly susceptible to permanent deformations, producing rutting at the road surface. Rutting affects the safety level of the pavements, specifically in the case of rainfall when aquaplaning causes cars to lose control. In winter, the water penetrating into the road surface layer will become frosted coupled with volume expansion deteriorating this pavement layer (potholes, stripping). The combination of low surface temperatures and cooling down of the air with a high relative humidity will cause white frost and icy road surfaces, affecting the safety of drivers. The temperature differences between summer and winter, but also between night and day cause expansion and contraction of the road materials. The subsequent stresses and strains affect the fatigue lifetime of the pavement and produce road cracking [2].

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III. RESULTS

The designed pavement with drainage underneath has checked the impact of weather on water in drain pipes. Temperature is calculated according to the weather temperature and it is tested for three days and daily for 7 hours. According to exposure of atmosphere condition, temperature varies with the surface of flexible pavement and it analyzed by the help of following data. Apply water in copper wire under the bitumen and record the temperature of water and it leave it for 7 hours. After completing the time we again record the temperature of water which is increases by 11, 9 and 8 degree for pipe 1, 2 and 3 respectively. There is maximum increase in temperature in pipe 1.

Table 1: Temperature Variation of Flexible Pavement Surface of Day 1

Temperature Variations	Pipe 1	Pipe 2	Pipe 3
Initial Temp. of Water	22°C	22°C	22°C
Temp of Water after 7 hours	33°C	31°C	30°C
Temperature Difference	11°C	09°C	08°C

Apply water in copper wire under the bitumen and record the temperature of water and it leave it for 7 hours. After completing the time we again record the temperature of water which is increases by 12, 10 and 7 degree for pipe 1, 2 and 3 respectively. There is maximum increase in temperature in pipe 1.

Table 2: Temperature Variation of Flexible Pavement of Day 2

Temperature Variations	Pipe 1	Pipe 2	Pipe 3
Initial Temp. of Water	23°C	23°C	23°C
Temp of Water after 7 hours	35°C	33°C	30°C
Temperature Difference	12°C	10°C	07°C

Apply water in copper wire under the bitumen and record the temperature of water and it leave it for 7 hours. After completing the time we again record the temperature of water which is increases by 11, 9 and 7 degree for pipe 1, 2 and 3 respectively. There is maximum increase in temperature in pipe 1.

Table 3: Temperature Variation of flexible Pavement of Day 3

Temperature Variations	Pipe 1	Pipe 2	Pipe 3
Initial Temp. of Water	24°C	24°C	24°C
Temp of Water after 7 hours	35°C	33°C	31°C
Temperature Difference	11°C	09°C	07°C

IV. CONCLUSION

The project is with objective of meeting at least 60-70% of all energy needs required for road networks. Better control of the thermal condition on pavements will improve the safety, reliability and sustainability of the road networks. This is an experiment, assembled with commonly available components and techniques, which will produce various results and demonstrates that energy recovery by controlling the thermal conditions of pavements has potential and is more than a scientist’s dream. The harvested energy can be considered as renewable source of energy to fulfill the increasing energy demand of the road infrastructure for all kind of facilities to support the traffic flows, such as lighting, traffic control systems, intelligent road markings and various communication services (telephones, road sensors, information panels and infrastructure-driver communication).The results will help us to decrease the deterioration of layers of road surface, which will be beneficial for us and country from the economic and safety point of view. The increasing prices of fossil fuels and the aim to replace these resources by sustainable, renewable energy sources will make energy recovery from pavements more and more attractive.

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