

A REVIEW ON SMART PERMEABLE PAVEMENT

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ABSTRACT—The objectives of this paper is specifying the smart permeable pavement characteristics, its uses, future scope and this paper also provide guideline to dealing with current traffic, ecological and resource utilization problems. Conventional roadways of bitumen asphalt and concrete is replaced by newly invented smart permeable pavement roadways. The features of the smart permeable pavement is generation electricity, it create intelligent highway infrastructure , decentralized self healing powergrid system, reducing the consumption of fossil fuels and it prevent water logging conditions on roadways and reducing the runoff of water on the surface of the roads.

Keywords—Smart permeable pavement, smart grid, water logging, resource utilization, energy generation, water runoff.

I. INTRODUCTION TO PAVEMENT

The smart permeable pavement is a partially solar driven technology. In this pavement the electricity is generated in two ways:-

1. Energy generated from photovoltaic cells.
2. Energy generated from piezoelectric plates.

It consist of tempered glass in top most layer which has impact and skid resistance property, it prevent from generation of skid marks on the surface of roadways. It also reduces the potential impact of surface runoff on the surface is used to various industries, commercial and domestic purposes are used.

This type of pavement is imagined for the development of smart roadway and accounting of various environmental problems such as emission of green house gases, increase in rate of global warming, increase in rate of carbon footprint and air pollution rate of stratosphere.

The ultimate goal of this pavement is generate and store the energy along the side of the roadways. Due to this pavement technology it replaces all current non renewable resources with renewable resources which is required to generate electricity and transportation facility.

II. MODULES OF SMART PERMEABLE PAVEMENTS

A. Tempered glass layer/toughened glass layer

This is topmost layer which is provided in smart permeable pavement roadways. This layer is also called as transparent layer which permit solar rays incident on photovoltaic cell. The glass which is use in this type of layer the hardness of the glass is four to five times stronger than conventional asphalt roads. Hardness of this glass on Mohr's scale is between 5.5 to 6.

B. Energy harvesting layer

This layer consist of various electronic units such as photovoltaic cell, peizosensor, temperature sensor, heater thermostats, heating probe, passive infrared sensor which detecting the presence of human by body heat.

C. Bottom layer/Supporting layer

The main function of this layer is to collect/store all generated energy from the energy harvesting layer and disseminate this energy along the adjacent sides of the roadways. The intelligent grid system embedded in this layer which helps to avoid providing of electric transmission poles, towers and also eliminates the large complex network of transmission line.

III. ECONOMIC CHARACTER

The smart permeable pavement helps to the government for borrowing more profit from various private and commercial sectors. After implementation of such type of pavement a huge amount of energy is generated which calculate in the unit of MW (Mega Watt) and this energy utilized by street lights, parking and road

amenities , lawns , rehabilitation centers, gymism, cinema theatres and public places. Construction of smart permeable pavements doesn't require bitumen. So, it will eliminate ultimately usage of fossil fuels. Optimization of resources also takes places at time of construction of such type of pavement.

After completion of construction cycle of smart permeable pavement it will help to urbanization interconnecting various states, cities and also villages through smart grid system which is also called as two way communication smart system. This system also helps for finding out unauthorized electric connections. The end users who use this system a smart meter installed in his home.

IV. LITERATURE RESEARCH

The Smart Permeable Pavement consists of established solar panel that we impel on. Each Road Panel interconnected with nearby panels to form the Smart permeable pavement Road system. This Roadway replaces our weakening petroleum-based asphalt highway communications with an intellectual road. The Smart permeable pavement harvest electrical power from the sun rays and become our nations decentralized, intellectual, self-healing power grid, replacing our current deteriorating power circulation infrastructure.[1]

Generated energy received is transmitted to the base plate level and also it keeps the road operation properly, and the base plate level determines where the energy is required to go and disseminates energy (collected from the electronic energy harvesting layer) and data signals (phone, TV, internet, etc.) to all homes and businesses connected to the Smart pavement.[2]

Initially, establish and preservation costs of building smart roadways and parking lots may be exceptionally high. (However, advances in this knowledge will optimistically cause the costs to fall.) Another question to deal with is the effectiveness of solar panels. The middling efficiency is presently a matter of worry. [3]

Rising urbanization has caused troubles with amplified burst flooding after impulsive rain. Areas of shrubbery are replaced by concrete roads, asphalt roads, RCC multistory buildings, sky scrapper or monumental structure, the area loses its strength to soak up rainwater. Excessive rain water runoff on conventional roads causing flood and water logging conditions. Smart permeable pavement consisting of wide variety of materials that allow the vertical movement of rainwater through the wearing course of roadways. In addition to reducing the impact of runoff, this smart permeable pavement also act as a filtering layer which reducing inflow of pollutant in ground water. [4]

The inspiration of smart permeable pavement is not only to accumulate solar power and storm water but to also make well-dressed roads. Roads which light up themselves at hours of darkness warm up themselves in the iciness and are easily programmable to guide the drivers. Smart permeable pavement is used to charge the electronic vehicle along the adjacent side of smart roadways and providing charging spots at various locations on roadways. This type of pavement consisting

of induction plate in its top wearing course which emits electro-magnetic waves and these waves are catch up by electric vehicle .For proper working of this wireless charging we required of metallic shell of electronic vehicle. [5]

V. CONCLUSION

Because of implementation of smart permeable pavement we can create major source of clean energy which is majorly responsible for optimization natural resources This type of pavement eliminate dependency of fossil fuels, eliminate emission of green house gases. This pavement also helps to tackle conventional pavement problems e.g. it provide highly resistance to formation of potholes, lowering down the cell phone dead spot, this pavement requires less time to repair and ease of construction and it can also filter storm water.

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