ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 10| October 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

DESIGN OF ROAD PAVEMENT USING PIEZOELECTRIC HARVESTER - A REVIEW

Ms.Damini Pradhan , Ganesh Vitkar ,Rahul Kamble, Saurabh Janjal
Lecturer, Student, Student, Student
Y. B. Patil Polytechnic, Akurdi, Pune, India

ABSTRACT
In the era in which the need for sustainability in terms of harvesting energy (electricity) using elements which are present for free and upgrading the traditional method of energy harvesting by using piezoelectric materials for harvesting electricity by the pressure exerted by vehicle on the pavement. In this project the pressure energy which is being wasted can be used as source for producing electricity .The future of transportation focuses on smart and green technologies, with energy harvesting. Piezoelectric systems, known for their ability to capture pressure energy without external power, have gained interest for producing electricity.

INTRODUCTION
Today electricity has become a source of living one cannot even imagine living a day without electricity. Electricity is basic need for everyone. Due to increase in population the demand for supply of electricity is also increasing. The urges to generate electricity for growing population in a very eco-friendly way without causing any harm to the environment as the traditional way of producing electricity uses lots of burning of fuels to run thermal power plants, this plants are known to pump out a lots of greenhouse gases into the environment. So for this a study for generating electricity from some eco-friendly sources like piezoelectric materials which exhibit a fascinating property known as piezoelectricity, which enables them to convert mechanical energy (pressure energy) into electrical energy. By using this piezoelectric materials into road pavements we can produce electricity by the pressure exerted by the traffic on the road pavements. A large amount of pressure energy is wasted during the movement of traffic, so why not use this traffic as a source for generating energy.

SCOPE OF WORK
- Piezoelectric roads can generate clean, renewable electricity by pressure exerted by movement of vehicles on road.
- Piezoelectric roads can help develop sustainable, environmentally friendly infrastructure.
- Piezoelectric roads can integrate with smart cities by powering sensors, smart lighting systems.
- Piezoelectric roads can optimize the use of energy resources.

MATERIAL
- Bitumen-
  A black, sticky, viscous petroleum by-product that acts as a binder to hold aggregates together.

The most common types used in India are VG-10, VG-20, VG-30, VG-40, and VG-50.

- Aggregates-
  These include sand, gravel, or crushed stone.
- Crushed stone-
  An angular rock that's used as a base material for roads. Crushed stone is durable and solid, making it suitable for heavy traffic loads.
- Pavers: Spread hot mix asphalt evenly across the road surface.
- Roller equipment: Compact the asphalt for the road base.
- Customized piezoelectric sensors.
- Copper wire of 2.5mm
- Rechargeable battery.
- Rectifier circuit (AC/DC).
- Wire conduit (Flexible And Rigid).
- Junction box.

METHODOLOGY
Construction of Piezoelectric roads

Step 1- Preparation of Sub base course
The first layer of the road , usually made of riverbed aggregates, rocks, or alluvial fans.

Step 2- Preparation of Base course
Made of coarse aggregates like gravel, crushed stone, or sand, mixed with a bituminous binder. This layer provides a stable foundation for the road and helps distribute the weight of traffic.

Step3-To create a strong base for placing the generator, a thin layer of asphalt is laid.

Step 4- Fixing the piezoelectric generators on asphalt layer as per design.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 10| October 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

Step 5-Connecting the generators in parallel series for getting collective output.

Step 6- Preparation of Hot mix
A hot mix of bitumen and aggregate is prepared and placed using a paver.

Step7- Compaction of layer.
Step 8- Finishing

REFERENCE

1. *https://en.m.wikipedia.org/wiki/Piezoelectric_sensor*
2. *https://www.embedded.com/the-fundamental-problems-with-traditional-power-transmission/*
3. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10249095/*
4. *https://www.researchgate.net/publication/373712644_Research_progress_and_latest_achievements_of_road_piezoelectric_vibration_energy_capture_technology_based_on_intelligent_transportation_construction*
5. *https://pubs.acs.org/doi/10.1021/acsomega.3c00672*
6. *https://www.mdpi.com/1424-8220/23/9/4238*
7. *https://academic.oup.com/iti/article/doi/10.1093/iti/liad014/7260582?login=false*
8. *https://www.sciencedirect.com/science/article/pii/S2211467X24001299*
9. *https://www.researchgate.net/publication/264048646_Piezoelectric_Energy_Harvester_Design_and_Power_Conditioning*
10. *https://www.researchgate.net/publication/345898453_Waste_to_Energy_A_Review_on_Generating_Electricity_in_India*
11. *https://www.scirp.org/journal/paperinformation?paperid=117173*
12. *https://indiabookofrecords.in/an-innovative-piezoelectric-road-model/*
13. *https://journals.sagepub.com/doi/full/10.1177/15589250231151242*