Harvesting Energy from Pavements

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Abstract. Rapid Industrialization and Urbanization has amplified the dependency of Indian economy on import of fossil fuels such as Oil, petroleum, and Natural Gas for energy production. The excessive consumption of these fossil fuels is always associated with high greenhouse gas emissions which can affect the Climatic changes and ecological balance of the country. Hence, the need for innovative technologies to harvest energy has increased. *Energy Harvesting* or *Scavenging* is the process of capturing the wasted energy from naturally occurring energy sources, accumulating and storing for later use. India has the second largest road network in the world. Hence, connecting road network can prove to be beneficial if used as a source of energy. From pavements two sources of energy can be identified viz., solar energy and mechanical energy. Technologies dealing with solar energy are – Asphalt Solar Collector combined with piping system, photovoltaic cells and thermoelectric Generators. Technology dealing with Mechanical energy is by using embedded piezoelectric crystals. The primary focus of this paper is to quantify the electric voltage generated by a bituminous specimen for different positions of piezoelectric crystals for same impact loading. The harvested energy can be used for small scale road applications like road furniture, lighting, roadside advertising or railway and airport signage where the installation and maintenance cost are low.

Keywords: Energy harvesting · Piezoelectric crystals · Bituminous mix

1 Introduction

Conservation of energy is of paramount importance as far as sustainability is concerned. The different natural resources that accomplish the global energy demand are fossil fuels, water currents, wind energy, tidal energy, solar energy, geothermal energy, biomass energy and nuclear energy. According to the statistics presented by UN Division of Sustainable Development, around 2.8 billion people do not have access to modern energy services and over 1.1 billion do not have electricity which demonstrates the severity of the energy crisis. By 2035, Global energy demand is expected to increase by more than one-third with Asian countries China, India and the Middle East accounting for about 60% of the increase. This warrants the development of alternate, viable and sustainable sources for energy.

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