"Electric Vehicle Static Wireless Charging System Using Solar Power"

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Abstract

Wireless power transmission is the way to transfer power without using wire. Wireless power transmission helps to connect those area where people are unable to get a suitable power source. Everyone can get clean and green wireless power. In future all the devices will relate to the power supply source wirelessly. Wireless charging of electric vehicles (EVs) has been in development for several years in preparation for the growth in adoption of these vehicles. Wireless charging systems today offer an efficient, flexible means of charging EVs from multiple classes and at a range of power levels from a common ground source. Standardization activities are well underway to ensure compatibility between systems across vehicle makers and location in this paper we have presented the successful experimental attempts to transmit power wirelessly and future scope of wireless power transmission in Electric vehicles.

Keywords: Electric vehicle; high frequency converter; wireless system; Power; Charging.

- **INTRODUCTION:**

In the whole world electricity transfer from power station to everywhere is through wire. Wireless power transfer technology can potentially reduce or eliminate the need for wires and batteries. Wireless transmission is useful to power electrical devices where interconnecting wires are inconvenient, hazardous, or are not possible. Wireless power transfer technology reduces the use of electric wire which is made of copper and aluminium metal. The metal which are used to make electric wire will extinct in future. If we implement wireless power transfer technology the use of electric wire will reduce. It would be beneficial if in future, we can implement wireless power transfer technology to transfer power from power station to everywhere without the need of wire. Autonomous vehicle fleets provide another compelling reason to deploy wireless charging. When there is no one to plug in, but the vehicle can drive itself to a charging spot, wireless charging becomes not a convenience but rather a necessity. This paper reviews the application of magnetic resonance based wireless power transfer to the charging of electric vehicles. It includes an overview of the technology for this application, some performance data from a state-of-the-art system, a review of activities in standardization of the technology, and a discussion of some remaining challenges to widespread adoption.

In foreign countries, European and American are promoting the construction of electric vehicle charging facilities with direct or indirect preferential subsidy policies. By 2020, China is expected to construct more than 12,000 centralized charging and replacement power stations and more than 4.8 million decentralized charging piles to meet the charging demand of 5 million electric vehicles in China. It is self-evident that in the next few years, the global electric vehicles and supporting charging facilities will mushroom to usher in the golden age of their development. However, due to the aging of the charging line, the complexity of operation and the entanglement of the charging pile, the safety and user experience are greatly compromised in actual use.

- **Wireless Power Transfer system:**

Wireless power transfer (WPT), wireless power transmission, wireless energy transmission (WET), or electromagnetic power transfer is the transmission of electrical energy without wires as a physical link. In a wireless power transmission system, a transmitter device, driven by electric power from a power source, generates a time varying electromagnetic field, which transmits power across space to a receiver device,

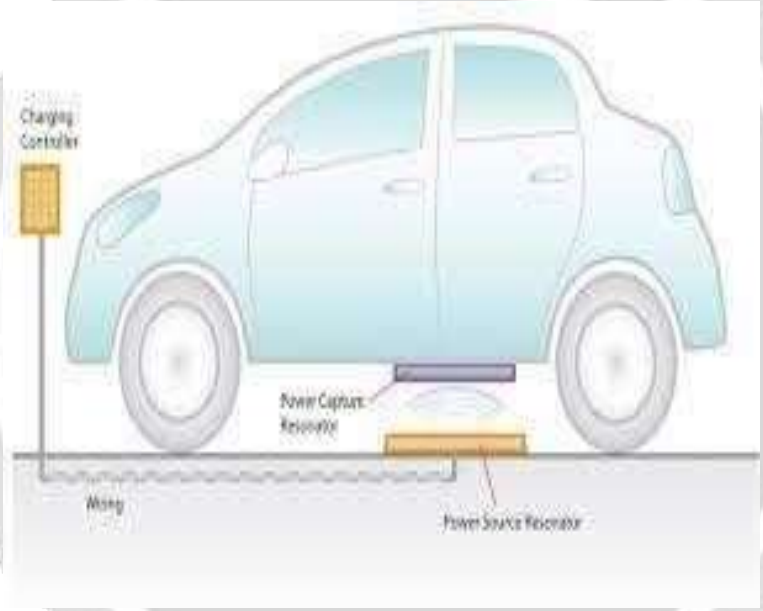
which extracts power from the field and supplies it to an electrical load. The technology of wireless power transmission can eliminate the use of the wires and batteries, thus, increasing the mobility, convenience, and safety of an electronic device for all
users. Wireless power transfer is useful to power electrical devices where interconnecting wires are inconvenient, hazardous, or are not possible

- **Types of wireless Charging Methods:**

Mainly, there are two types of IPT for the wireless charging:
1. Static IPT is deployed when the vehicle is spotted in a parking lot.
2. Dynamic or Quasi-dynamic IPTs are deployed when the vehicle is either on move or a brief stop at the traffic red light respectively.

- **Stationary Charging**:

Wireless inductive EV charging transfers alternating current (AC) through a coil in the charging plate via a magnetic field to the car's inductive 'pick-up'. A voltage converter in the car then turns the alternating current into direct current (DC) with, which in turn charges the battery pack. A charging pad sits on the ground, connected to a wall-mounted power adapter. The car is parked over it. On the backside of the car there is a receiver when charger detects the receiver within range, it automatically starts charging.

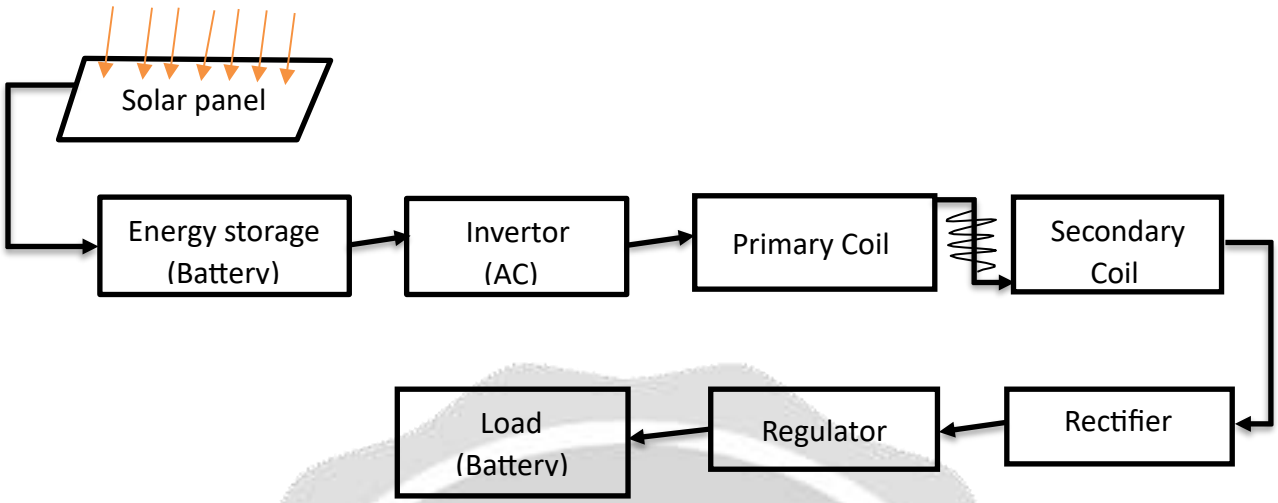


1.1 Static Charging system

Dynamically Charging:

Similar to the Stationary charging system the EV's are charged through the resonant coil but, here the vehicle can be charged while moving on the road. A Charging Lane will be provided alongside the roads where the people can move to charge their vehicles while driving. Dynamically charging system cannot be provided through wired system and their by the WPTs is required to provide this method of charging. Every electric bus has a wireless charging receiver. According to Figure Wireless chargers are embedded in the hard surface of a road or under the road surface at regular intervals.

Block Diagram:



1.2 Block Diagram

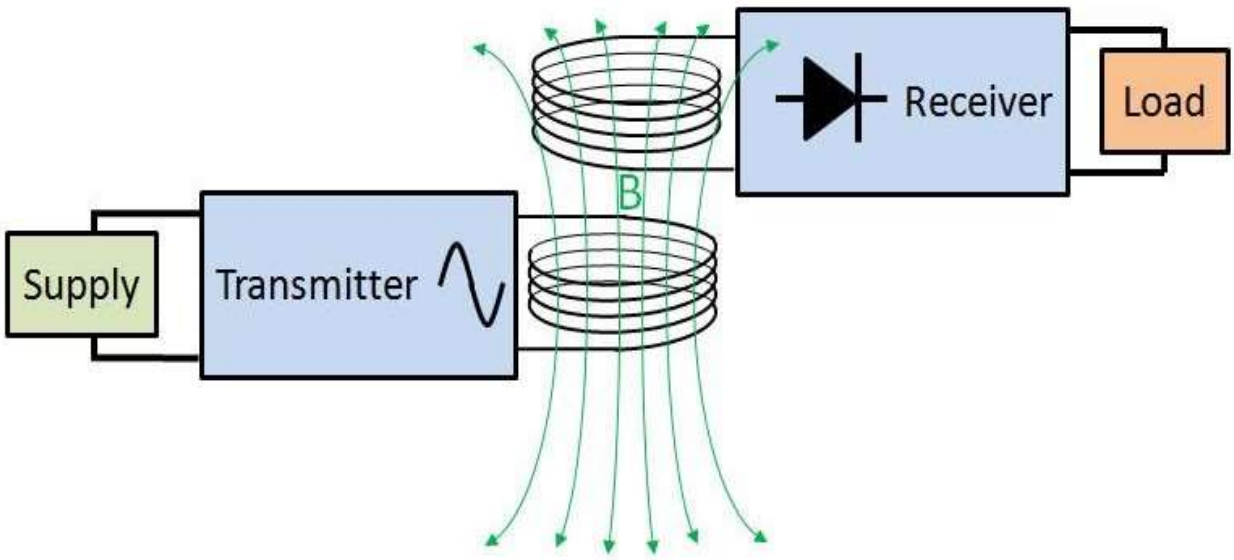
Design various components:

The design of a wireless Charging System involves several key components including the inverter, Rx and Tx Coil. The Coil is the primary component that transfer the power and is typically made from Copper Wire or Copper materials. The inverter is the mainly convert Dc supply to the high frequency Ac supply.

- **Rx & Tx Coil Design:**

An air-core wireless transformer design is used in the WPT to enable electrical power flow from the source to the receiver sides. shows the possible designs of the WPT system, several planar coil shapes such as circular, rectangular, and hybrid configurations that are used to improve the performance and solve the misalignment problems between the transmitter and receiver coil.

By considering above parameters and requirements, determine the bulk density, angle of repose, flowability, and other material properties. These will help determine the size, shape, and configuration of the screw [3]. Based on the material properties and flow rate, calculate the required screw diameter, pitch, and helix angle. The screw diameter should be large enough to accommodate the material flow without causing blockages or excessive wear. The pitch should be designed to move the material efficiently without excessive force or pressure. Determine the length and configuration of the screw based on the distance to be covered, the operating conditions, and any constraints. The screw may be straight or curved, depending on the specific requirements. The length of the screw should be sufficient to ensure proper material flow and avoid any material build up. Design the support structure and bearings to ensure that the screw is properly supported and aligned. The bearings should be chosen based on the load capacity, operating conditions, and any other requirements.



1.3 Primary & Secondary Coil

2.1.2 Construction:

The main concept of this project is to design a device for the concept of wireless power transfer to eliminate the use conventional copper cables and also current carrying wires. This project is built upon using a circuit which converts AC 230V 50Hz to AC 12V, High frequency (HF). The output is fed to a tuned coil shaping as main of an air core transformer. The minor coil develops a voltage of HF 12volt.Once these factors have been determined, the appropriate motor selected is, 2 HP induction motor at 1440 rpm, above 15 Nm torque.

Thus the power transfer can be done by the primary to the secondary that is divided with 3cm distance. So the transfer could be seen as the primary transmits and the secondary receives the power to run a load. In addition, this method can be used in several applications, like to charge gadgets like mobile phone, laptop battery, iPod, propeller clock wirelessly. And also this type of charging offers a far lower risk of electrical shock as it would be galvanically isolated. This is an Emerging Technology, and in future, the distance of power transfer can be improved as the study across the world is still going on

Conclusion

Wireless charging systems provide a convenient hands-off method to charge electric vehicles at the same speed and efficiency as standard conductive ac chargers. A broad view of wireless power transfer applications has been seen and wireless charging of electric vehicles using WPTS technology and its types has been studied

This chapter has dealt with the coil-coupling of a WPT system intended to charge an electric city-car. At first design of coil system is presented and by analysis carried out how different coil arrangements affect the performance of the coil-coupling in terms of inductive parameters. It has been found that, for a given outer diameter and distance of the coils, the spiral coil-coupling has an higher coupling coefficient compared to the helix one despite its lower self and mutual inductances.

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