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Wireless Charging of Electric Vehicle

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Abstract: Wireless power transfer (WPT) using magnetic resonance is the technology which could set human free from the annoying wires. In fact, the WPT adopts the same basic theory which has already been developed for at least 30 years with the term inductive power transfer. WPT technology is developing rapidly in recent years. At kilowatts power level, the transfer distance increases from several milli meters to several hundred milli meters with a grid to load efficiency above 90%. The advances make the WPT very attractive to the electric vehicle (EV) charging applications in both stationary and dynamic charging scenarios.

For energy, environment, and many other reasons, the electrification for transportation has been carrying out for many years. In railway systems, the electric locomotives have already been well developed for many years. A train runs on a fixed track. It is easy to get electric power from a conductor rail using pantograph sliders. However, for electric vehicles (EVs), the high flexibility makes it not easy to get power in a similar way. Instead, a high power and large capacity battery pack is usually equipped as an energy storage unit to make an EV to operate for a satisfactory distance. Until now, the EVs are not so attractive to consumers even with many government incentive programs. Government subsidy and tax incentives are one key to increase the market share of EV today. The problem for an electric vehicle is nothing else but the electricity storage technology, which requires a battery which is the bottleneck today due to its unsatisfactory energy density, limited life time and high cost.

I. INTRODUCTION

Contactless Power Transfer (CPT) systems are applicable for charging electric vehicles (EVs) without any physical interconnection. These systems can be installed on roadways in order to charge the vehicles while driving. The implementation of such on-road charging systems in order to extend the driving range and decrease the EV battery size is investigated in this paper. The percentage of road that should be covered and the power transfer capability of the system are estimated. Some design considerations, such as the distribution and the length of the CPT segments over the road, are explained. Finally, the total power demand for all the passing-by vehicles using the system is calculated and the possibility of powering the EVs directly from renewable energy sources is discussed.

This system based on Contactless Power Transfer (CPT), it is assumed that the vehicle can be powered while driving. The CPT systems can be installed on the main traffic lanes. The car will get energy supplied by the on-road CPT system and therefore a greater driving range can be achieved. Moreover, a smaller battery can be an installed to the car providing the same of even greater driving range. As a result, such systems can be a pathway to overcome the main bottlenecks of electric mobility i.e. the limited driving range and the high cost, which are both related to the technology and the specifications of today's batteries. A Contactless Power Transfer System (CPT) refers to a system where power can be transferred electro-magnetically with no physical contact. The system consists basically of an air-core transformer with two windings. The efficiency of such a transformer depends on the parameters of the primary and the secondary winding, coupling factor, as well as on the load and the operating frequency.

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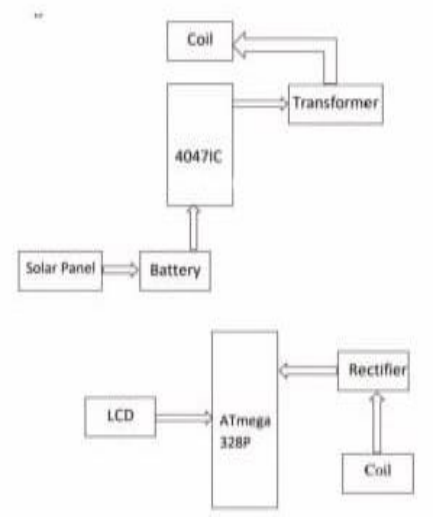
II. OBJECTIVE

- To design and develop a wireless power transfer (WPT).
- To implement inductive/Resonant coupling.
- To eliminate the need for manual plugging.
- To improve safety in adverse weather.
- To optimize power transfer efficiency.
- To minimize maintenance.

III. METHODOLOGY

- **Solar power generation:** Primary renewable energy source to generate electricity store in battery.
- **AC to DC Conversion:** DC power from battery fed into 4047IC which co-ordination with a transformer covert DC into AC required for wireless transmission.
- **Wireless Power Transmission:** This frequency AC is supplied to Transmitter Coil
- **Inductive Power Reception:** When vehicle receiver coil comes within the range of magnetic field an EMF is induce.
- **Rectification:** Induce AC power is then covert back to DC using Rectifier unit make it suitable for charging the vehicle battery.
- **System Monitoring & Control**: The **ATmega** 328P manages the entire process by monitoring incoming voltage and current through sensors
- **Real**-Time Display: Critical charging parameter, such as battery percentage and voltage levels are displayed on an LCD screen for the user.
- **IOT &/ Cloud Integration**: The system uses a **NodeMCU/ESP32** to upload real-time data to an IoT Platform(like Blynk or ThingSpeak)
- **Safety Mechanism**: A Relay Control system is integrated to automatically disconnect the power supply in case of overcharging disconnect the power supply in case of overcharging or technical faults.



Block Diagram

IV. CONCLUSION

The development of the Charging system for batteries project comprised of various disciplines like electrical, electronics, and mechanical engineering technologies. This project attempted to provide a framework for the battery charging station. The proposed charging system will be one of the initiatives taken to achieve a Green campus. It is clearly evident that the proposed battery charging system is better than the existing electrical charging system both in terms of operation and economical aspects. Researchers work on this project get a basic idea of the design and building of systems for several useful applications such as electrical vehicle system.

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