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HYBRID WIRELESS BATTERY CHARGING OF ELECTRIC VEHICLE

Barde Krushna[1], Jadhav Popat[2], Panchal Pramod[3], Dhekale Sneha[4], Prof. K. N. Kazi[5]

Student, Department of Electrical Engineering, S. B. Patil College of Engineering, Indapur [1,2,3,4]

Asst. Professor, Department of Electrical Engineering, S. B. Patil College of Engineering, Indapur [5]

Abstract- This paper aims to develop wireless charging technologies and it is also intended to give a message that how useful the plug-less battery car charging is by creating a proof of concept for inductive charging. Also this paper is designed to charge a rechargeable battery wirelessly. Since charging of the battery is possible to be demonstrated. This paper is built upon using an electronic circuit which converts AC 230V 50Hz to AC 12V. The output is fed to a tuned coil forming as primary of an air core transformer. The secondary coil develops a voltage of HF 12volt. Thus the transfer of power is done by the primary (transmitter) to the secondary (receiver) that is separated with a considerable distance. Therefore the transfer could be seen as the primary transmits and the secondary receives the power to run load. Moreover this technique can be used in number of applications, like to charge a mobile phone, iPod, laptop battery. And also this kind of charging provides a far lower risk of electrical shock as it would be galvonically isolated. This concept is an Emerging Technology, and in future the distance of power transfer can be enhanced as the research across the world is still going on.

All aspects of this vehicle are governed by the law of conservation of energy. The system here proposed can be useful for electric vehicle (EV) battery charging systems. It consists mainly of two copper coils, placed one in front of the other on the same axis. The inductor coil can easily be placed under the road surface (in a parking), while the other (the receiver coil) in the lower side of the vehicle. By exploiting the coils resonance coupling effect, electric energy can be transferred from the inductor coil to the receiver in order to charge the batteries. Wireless power transfer (WPT) using magnetic resonance is the technology which could set human free from the annoying wires. The advances make the WPT very attractive to the electric vehicle (EV) charging applications in both stationary and dynamic charging scenarios.

Keywords- *EMC- Electro Magnetic Coil, Tx– Transmitting Coil, Rx– Receiver Induction Coil, Buck Boost Converter, Transformer, Electromagnetic Induction Principle.*

I INTRODUCTION

The Wireless Power Transfer and Charging Module can be used in electronic equipment's in common use for close wireless charging or power supply. Consist of a Transmitter & Receiver and coil, it could serve as a replacement for the Wireless Power Supply with stable 5V output voltage and maximum 600mA output current. Its small size and insulation coil is more suitable for using in wireless paper. This module uses an electromagnetic field to transfer electric energy between a transmitter circuit and a receiver circuit. An induction coil creates an alternating electromagnetic field from within the transmitter circuit powered with 12V. The second induction coil takes power from the electromagnetic field and converts it back into electrical current to the receiver circuit that outputs 5V - 600mA.

In recent years, under the background of global warming, electric vehicle (EVs) using clean energy are getting more attention among the developed and developing countries. Wireless charging for electric vehicle would also be a convenient feature, avoiding any need to remember to plug-in power cord after parking vehicle. The cost of fuels like petrol, diesel etc. has been steadily increasing due to increased number of vehicles and proportional excess usage of

fuel. Depleting sources of these fuels are also a major concern. These age old designs of vehicles are the major contributors to the problem of greenhouse gases.

II PROBLEM STATEMENT

There is problem while charging the normal electric vehicle like, plug in the cable, plug out cable. And we tried to find solution on this. So that human efforts can be reduced.

- When supply given to the coil then more amount of heat is produced in the coil, because of that equipment in the circuit may be damaged.

Solution-To avoid this problem we used heat sink in our paper.

- At the receiving side variation of supply is received, that may effect on battery life, also effect on charging time.

Solution-To eliminate this problem we used capacitor to the receiving side, so that continuous supply is maintained.

III OBJECTIVES

- Wireless power transfer through EM coil.
- There is no physical connectivity between electric car and charging system.
- Battery will be charged at running as well as standstill condition.

IV LITERATURE SURVEY

More than century-old gasoline internal combustion engine is a major contributor to greenhouse gases. Electric Vehicles (EV) have the potential to achieve eco-friendly transportation. However, the major limitatio in achieving this vision is the battery technology. It suffers from drawbacks such as high cost, rare material, low energy density and large weight. The problems related to battery technology can be addressed by dynamically charging the electric vehicle while on the move. In-motion charging can reduce the battery storage requirement which could significantly extend the driving range of an electric vehicle. This paper reviews recent advances in stationary and dynamic wireless charging of electric vehicles. A comprehensive review of charging pad, power electronics configurations, compensation networks, controls, and standards is presented. [1]

In this paper, a review of existing wireless power transfer solutions used in electric vehicle battery charger is provided. The different levels of battery charger are discussed based on the recommended practice. The concept for each solution is reviewed and evaluated considering the performance of battery charger, power electronic limitations and the circuit topologies. Furthermore, the credits and disadvantages of the wireless power transfer technologies, compensation and power electronics requirement for electric vehicle are discussed and compared in detail. Finally, a proposed circuit topology for resonant inductive wireless charging is presented. [2]

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 (IPT). WPT technology is developing rapidly in recent years. At kilowatts power level, the transfer distance increases from several millimeters to several hundred millimeters 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. This paper reviewed the technologies in the WPT area applicable to EV wireless charging. By introducing WPT in EVs, the obstacles of charging time, range and cost can be easily mitigated. Battery technology is no longer relevant in the mass market penetration of EVs. It is hoped that researchers could be encouraged by the state-of-the-art achievements,

and push forward the further development of WPT as well as the expansion of EV. [3]

This paper presents wireless power charging to an electric vehicle (EV) focusing on resonant topology. The charging system is described and set up using the resonance coupling effect and single-ended primary-inductor converter (SEPIC) for a low DC charging. The transmitting power is applied at a frequency of 6.78 MHz across a gap in the short range between 10 cm to 20 cm. The experimental results show that the maximum efficiency up to 80 % from transmitter to receiver. The EV charging using wireless charging has been confirmed with park and ride demonstration at 10 W power charging scale. The real time of wireless power charging can be monitored via Zig bee system. This work shows not only the possibility of wireless power charging, but also the electromagnetic compatibility (EMC) issue is taken into account. [4]

In this paper a low cost prototype of wireless power transfer system based on air coupling is presented. The system here proposed can be useful for electric vehicle (EV) battery charging systems. It consists mainly of two copper wire coils, placed one in front of the other on the same axis. The inductor coil can easily be placed under the road surface (in a parking), while the other (the receiver coil) in the lower side of the vehicle. By exploiting the coils resonance coupling effect, electric energy can be transferred from the inductor coil to the receiver in order to charge the batteries. Low cost experimental tests carried out at DIEETCAM – University of Palermo, demonstrated the effectiveness of the proposed wireless power transfer prototype, being it capable to reach an efficiency of about 80% and more along a distance of 30 cm. [5]

V PROPOSED SYSTEM

In this paper wireless power transfer is done. This is a new technology. A current through a conductor produces a magnetic field surround it. The strength of this field depends upon the value of current passing through the conductor. The direction of the magnetic field is found using right hand rule. There are two EMF coil i.e. primary and secondary. There is the magnetic field between them.

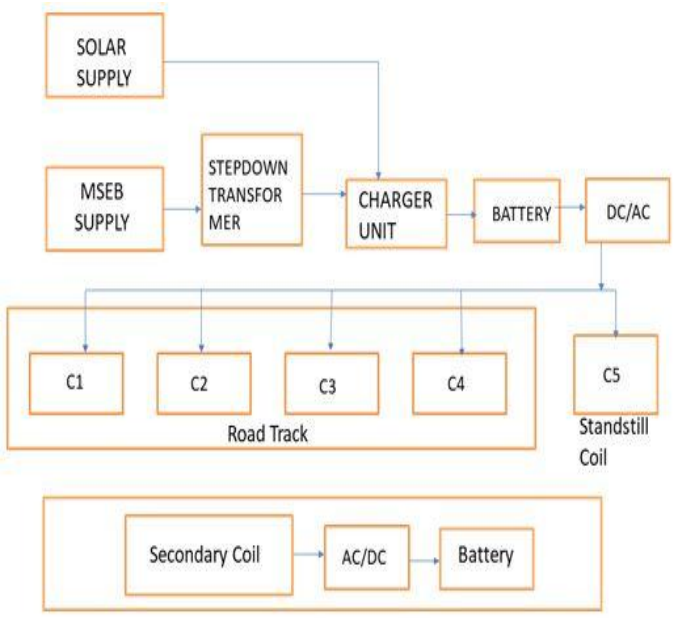


Figure 1: Block Diagram of Hybrid Wireless Battery Charging of EV'S

In this paper we all use a hybrid (MSEB+SOLAR) supply for the working of paper. When in the day time the solar energy is available but in night time the MSEB supply is used, so this is based upon hybrid system. During day time the supplies is given from solar panel and give to the battery through the freewheeling diode. The solar energy is in the DC form so this is helpful for the battery charging.

When the supply given from MSEB is 230v and converted into the 12v AC supply. This 12v AC supply is given to the voltage regulator with the help of half wave rectifier and the capacitor. This is the power supply design. The voltage is regulating into 12 AC to 5AC .The capacitor use to reduce or distort any distortion in the circuit. Then this supply is given to the opto-coupler's one terminal and another supply is given from the 12v battery to the terminal of the opto coupler. Opto coupler output terminal connected to the IGBT'S gate terminal. It produces the two waves one is positive half cycle

and another is negative half cycle in the circuit. The output of opto coupler is connected to the gate terminal of one IGBT through the resister and another output is connected to the IGBT gate terminal through the resister. IGBT'S produces the positive and negative half wave into the full sine wave. The source terminal of the IGBT'S connected to the primary side of the coil and the source terminal is connected to the secondary side of the transmitter coil.

The supply given from solar and the battery are connected to the buck boost convertor module. It is used in circuit to increase the current in the circuit. The output terminal of this is connected to the center tapped of the coils. This is helpful for the production of MMF in the circuit because of that the electromagnetic induction is occurred in the circuit and wireless transmission of the power is done.

In this paper the air is used as a dielectric medium. The secondary coil in the circuit is connected to the bridge rectifier .This is converted into the 12vAC to 5vDC.The battery is connected to this terminal of the bridge rectifier.

VI RESULTS

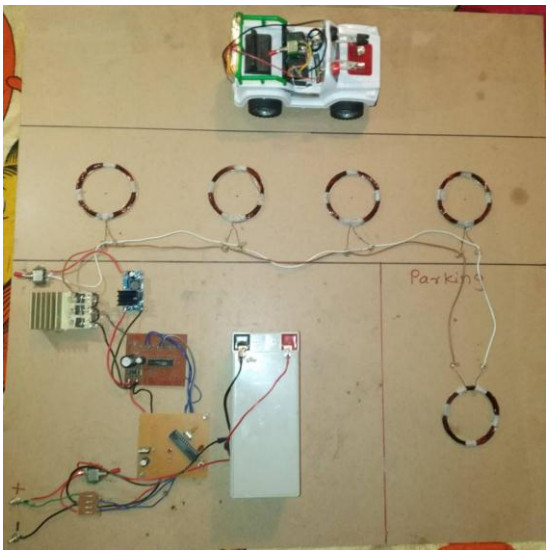
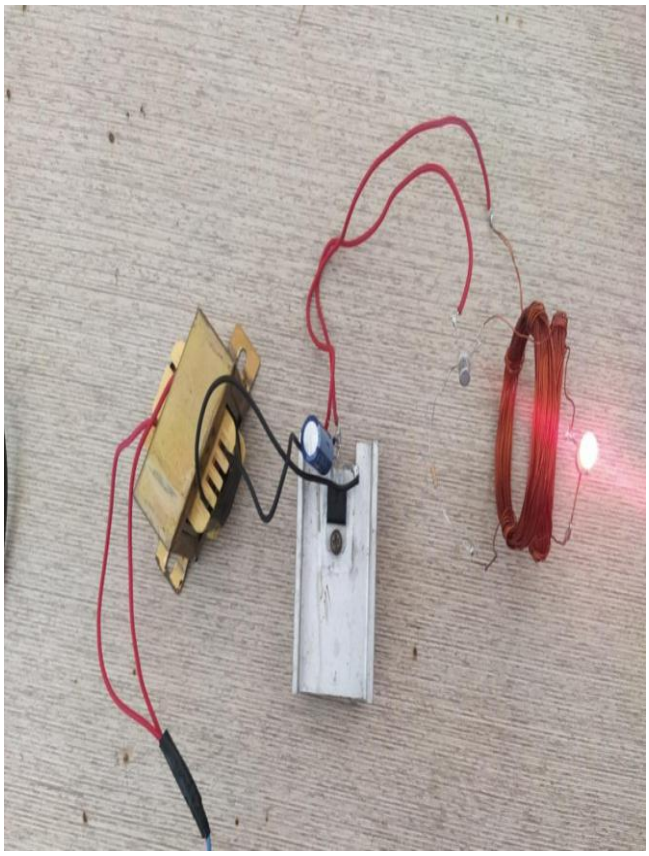


Figure 2: Hardware Configuration



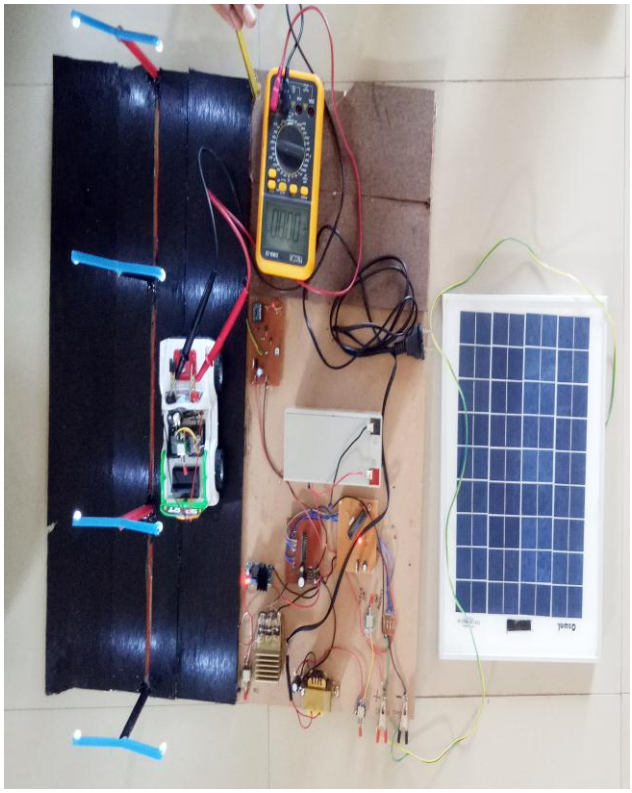


Figure 3 : Wireless Charging Module

VII ADVANTAGES

- On road charging is possible.
- Energy Efficient.
- Regenerative Braking.
- Easy to make Autonomous Vehicle.
- Easy Driving.
- Pollution Free Benefits of Electric Vehicle.

VIII LIMITATIONS

- Slow charging process.
- Cost is high.
- Charging distance is less.
- Low efficiency.

IX APPLICATION

- System can be placed in parking
- Can be used in toll plaza
- Road tracks can be made

X CONCLUSION

The equivalent input impedance of rectifier load is mainly affected by system load resistance and rectifier input inductance; rectifier load equivalent inductance will impact system performances, and should be considered for compensation network design; the proposed load estimation methods have good accuracy, but still need to be improved in further research; the proposed rectifier load calculation method and system load estimation methods all have good robustness on conditions of WCS parameter variations. Although the works in this paper are conducted based on the specific system, they can be extended to more applications, such as wireless charging systems with other rectifier or compensation network topologies, etc. They will be helpful for system design and control to make EV wireless charging systems achieve stable operation and high performance. On road charging is possible.

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