Wireless Power Transfer in Electrical Vehicle

[1]Amruth Premjith C [2]Adwaith S [3]Aadithya V S [4]Harisree S [5] Sanju B

Abstract

Wireless Power Transfer[WPT] using the magnetic induction technology which could avoid human from the hazardous accident caused due to the using of cables. By the using of MOSFET switches in the inverter, it creates the output with high frequency improves the efficiency of power transfer between the coils. Due to this creation of output with higher frequency the charging of battery will be very fast and efficient. By connecting the solar panel to the supply battery, it will be charged continuously using this panel. This will helps the users for the non-stop driving. These advances make the WPT very attractive to the electric vehicle charging application in both stationary and dynamic charging. By introducing WPT in electric vehicle, the obstacles of charging time, range, and cost can be easily managed. WPT technology is developing rapidly in recent years.

Keyword- Wireless Power Transfer [WPT], MOSFET, Electrical Vehicle

I. INTRODUCTION

Now-a-day the world facing the most serious problem is the energy demand. Instead of this we had various techniques for the generation of energy which should be hazardous to our environment. So we step into the Non-renewable energy which will be eco-friendly to our environment. Our main demand will be the fuels used in automobiles and it causes the major impact to our environment, so we introduce the hybrid version of Non-renewable energy in the vehicle as electric vehicle which acts eco-friendly to our environment. We use both the combination of wireless power transfer and the solar energy which helps us the user for non-stop driving. In an electric vehicle the battery is too tough to design due to its high energy density and power density. Now-a-days there are many types of batteries used in the instruments but the lithium-ion batteries gives the most suitable solution for the electric vehicles. Recently the Wireless Power Transmission has been a most effective topic in the transportation system. This paper starts with a basic concept of Wireless Power Transfer and it gives a brief overview of Wireless Power Transfer system and it includes the Magnetic induction principles, Existing and Proposed system, High frequency power output, Solar panel and some other issues like safety considerations. By introducing the latest achievements in Wireless Power Transfer, we hope that this will achieve in all over the world.

Now-a-day the term 'wireless' becomes the most advanced and innovative research field. This will help the people to free from annoying wires and to avoid them from exposing to hazardous accidents which occur due to the using of cables. It will help us the user for using the electronic devices without any interpretation and limitations. It will be hybrid with the solar energy and implemented in the automobiles will made the vehicle ecofriendly to the surrounding. This wireless power transfer also has the advances of both stationary and dynamic charging of the batteries.

Global warming becomes a most dangerous problem in now a day. This increases the heat in the earth surface and makes the ice peaks to melt down this increases the sea level will be dangerous to the entire world mainly because of the pollution. The main polluting factor is the automobiles which emit the carbon monoxide had a very harmful impact to the environment. So we had introducing the electric vehicle with the combination of 'wireless' power transfer made the EV high efficient and it will create the pollution free environment. It also protects the people from inhaling of hazardous carbon monoxide and leads a people to live in a healthy environment.

II. PROPOSED SYSTEM

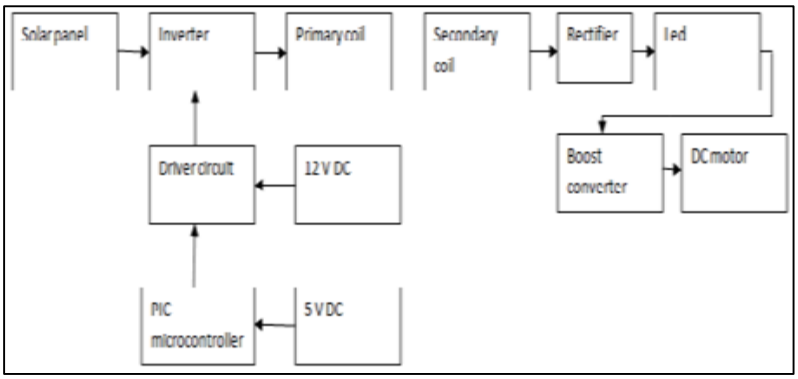

Fig. 1: Block of Wireless Power Transmission

In our project, block diagram consist of two types namely,

1) Primary Side
2) Secondary Side

A. Primary Side

The photo voltaic (or) Solar panel will be used in the initialization process of the circuit which generates the power for the whole operation. It absorbs energy from the solar radiation and this heat energy will be converted into electrical energy, this will be supplied throughout the circuit. Inverters will be used for converting the DC to AC, power generated by the solar panel will be the DC, these DC power will convert into AC power which it is given to the coil. The inverters consist of four n-channel MOSFET switches these switches needs the triggering pulses for the ON and OFF process, these triggering pulses will be generated using the PIC controller. This PIC controller will generate a triggering pulse of 5v DC. But the MOSFET switches needs a minimum of 10 – 12v DC for operating the voltages. For the amplification process the driver board will be used. Output of the PIC controller will be given to the driver board, it starts amplifying the triggering pulse that the output of the driver board will be given to the inverter. This driver board output will be connected to the gate terminal of the MOSFET switches. After the conversion of power it will be transferred to the coil through the compensation network.

B. Secondary Side

The coil from the primary side gets energize and it creates the magnetic field around the coil. Due to the using of high frequency output, the creation of magnetic flux will be very strong. The flux from the primary coil links the secondary coil. Hence the power will be transferred between the coils through the magnetic field. Next the power from the secondary coil given to the rectifier. After the rectifier the LED which indicate the power transfer to the coil. By using the rectifier AC supply will be converted into DC supply and then it is given to the booster circuit responsible for the steady output. After that it will be filtered by using the compensation network and finally connected to the DC shunt motor (Toy car motor). The solar panel power supply will be given to the motor. Due to the continuous generation of power via solar panel, it helps for non-stop driving.

III. CIRCUIT DIAGRAM

The photovoltaic panel (PV) will be used as the power source for the whole operation of the circuit. DC power will be generated by the solar panel will not suitable for transferring in the coil. Hence the DC power will be given to the inverter. The inverter will consist of MOSFET switches activate using the trigger pulse and convert DC to AC power. It will give the high frequency output to be filtered using the compensation network and then the energy will be transferred to the primary coil. Primary coil get energize which creates the flux in the coil these flux which links the secondary coil and current will transferred be between the coils. Then it will be filtered and after given to the rectifier which converts the AC power to DC power. Power transferred will be indicated by the LED and moves to the booster circuit which gives out the steady output conducted by the diode and compensating network. Finally the desired output will be given to the DC motor (Toy car motor).

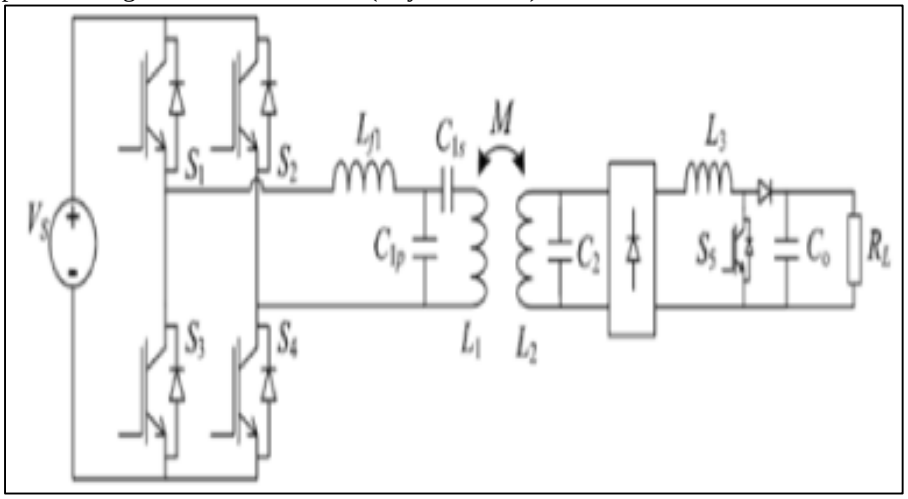

Fig. 4: Circuit of Wireless Power Transfer

A. Coupler in Stationary Charging

In a stationary charging the coupler is designed in pad form. The very early couplers are just like a simple split core transformer. Usually this kind of design could only transfer power through a very small gap. According to magnetic flux distribution area the coupler could classified as the double side and single side type. For the double sided type the flux goes to both sides of coupler. When the shielding is added, the quality factor of a flux pipe coupler reduce from 260 to 86. Double sided coupler having half of the main flux at the back. This makes the shielding effort.

B. Coupler in Dynamic Charging

The dynamic charging also called OLEVs or road way powered electric vehicles. It is two way to charge the EV while driving. Dynamic charging ca also solves the EVs range anxiety. In dynamic charging system the magnetic component are composed of a primary side of the coupler. Which is usually buried under the road and secondary side pickup coil? When EV with a pickup coil is running along with the track and it can able to transfer the power continues. The track can be simple as just two wires and adoption of ferrite with U or W type to increase the coupling and power transfer distance.

C. Wireless Power Transfer

WFT or Electromagnetic power transfer is the transmission of electrical energy without using the wires. Wherever the interconnecting wires are inconvenient in such places Wireless power transfer is more compactable. This wireless power transfer system which gives the advantages of using cables and that could avoid the short circuits, flux leakage and fire accidents. Wireless Power System consists of two sides, transmitter and receiver. Mainly the Resonant coils are used in the power transfer. The two coils are tuned to the same resonant frequency and the power is given to the transmitter side, resonant coils get energized and create the magnetic flux or field that links the coil. By the magnetic resonance technology the power will be transferred due to the magnetic vibration for the required distance.

IV. CONCLUSION

In this study, we are presenting the various technologies related to Wireless Power Transfer system, which is used to avoid the flux leakage and short circuits occurred due to the cables. This will be helpful for those who are doing research in the area of wireless power transmission. The wireless Power Transmission is used to operate the cars with high efficiency and improve the quality parameters. This project is in the progress of generating power source through renewal energy.

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