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Wireless Power Transmission in Vehicle

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***Abstract*: The objective of wireless power transmission in vehicle to vehicle is made to improve the conventional way of power transmission. it is a way which is noiseless cost effective and convenient charging. The losses occur due to wires is about 20-30%, hence WPT can reduce those losses and also minimize the pollution level due to resources used. WPT technology is developing rapidly in recent years. In this project the vehicle battery gets charged without any physical contact.by using WPT technology the obstacles in charging of a vehicle in normal and abnormal condition are avoided, as less the time required, range of power to be transferred can be increased, the cost will be affordable.**

***Keywords*: Inductive power transfer, Wireless power transmission.**

1. Introduction

The Demand of Electricity is increasing day by day as the population of world is increasing. So use of electricity efficiently and in controlled manner has become the most important aspect of today's power system. Most of the power system uses wired transmission of power and loss occurred due to this is very high. About 30% of the total loss in power is just because of wired power transmission and distribution. The main reason behind this loss is the resistance of wires during transmission. India's Electricity grid has highest percentage of losses in the world. Wireless power Transfer can be effective option to overcome these losses as Wireless Power Transfer uses Wireless mode of transmission. In India Losses due to power theft are increasing rapidly and Wired Transmission somehow helping power theft as wired transmission is more easy to power theft. In Addition to losses, Wastage of electricity is a big problem in Power System.

Wireless Power Transfer and its application can be extremely useful in Electricity Generation and transmission. Wireless Power transfer is basically works on the principle of Transformers. We can say that transformer is a motive of Wireless Power Transfer. The concept can be used efficiently in Electricity to minimize Cost, losses and maximize the Efficiency. Concluding to this we can develop a system that could provide much higher Efficiency, low Transmission Cost and Secured to power theft.

2. Methodology

A. Witricity technology

Witricity technology is transferring electric energy or power over distance without wires. The basics of electricity and magnetism, and work our way up to the Witricity technology are,

1) Electricity

The flow of electrons (current) through a conductor (like a wire), or charges through the atmosphere (like lightning). A convenient way for energy to get from one place to another.

2) Magnetism

A fundamental force of nature, which causes certain types of materials to attract or repel each other. Permanent magnets, like the ones on your refrigerator and the earth's magnetic field, are examples of objects having constant magnetic fields. Oscillating magnetic fields vary with time, and can be generated by alternating current (AC) flowing on a wire. The strength, direction, and extent of magnetic fields are often represented and visualized by drawings of the magnetic field lines. As electric current, I, flows in a wire, it gives rise to a magnetic field, B, which wraps around the wire. When the current reverses direction, the magnetic field also reverses its direction. The blue lines represent the magnetic field that is created when current flows through a coil. When the current reverses direction, the magnetic field also reverses its direction.

3) Electromagnetism

A term for the interdependence of time-varying electric and magnetic fields. For example, it turns out that an oscillating magnetic field produces an electric field and an oscillating electric field produces a magnetic field.

4) Magnetic Induction

A loop or coil of conductive material like copper, carrying an alternating current (AC), is a very efficient structure for generating or capturing a magnetic field. If a conductive loop is connected to an AC power source, it will generate an oscillating magnetic field in the vicinity of the loop. A second conducting loop, brought close enough to the first, may "capture" some portion of that oscillating magnetic field, which in turn, generates or induces an electric current in the second coil. The current generated in the second coil may be used to power devices. This type of electrical power transfer from one loop or coil to another is well known and referred to as magnetic

induction. Some common examples of devices based on magnetic induction are electric transformers and electric generators

5) Energy/ Power Coupling

Energy coupling occurs when an energy source has a means of transferring energy to another object. One simple example is a locomotive pulling a train car the mechanical coupling between the two enables the locomotive to pull the train, and overcome the forces of friction and inertia that keep the train still and, the train moves. Magnetic coupling occurs when the magnetic field of one object. An electric transformer is a device that uses magnetic induction to transfer energy from its primary winding to its secondary winding, without the windings being connected to each other. It is used to "transform" AC current at one voltage to AC current at a different voltage interacts with a second object and induces an electric current in or on that object. In this way, electric energy can be transferred from a power source to a powered device. In contrast to the example of mechanical coupling given for the train, magnetic coupling does not require any physical contact between the object generating the energy and the object receiving or capturing that energy.

6) Resonance

Resonance is a property that exists in many different physical systems. It can be thought of as the natural frequency at which energy can most efficiently be added to an oscillating system. A playground swing is an example of an oscillating system involving potential energy and kinetic energy. The child swings back and forth at a rate that is determined by the length of the swing. The child can make the swing go higher if she properly coordinates her arm and leg action with the motion of the swing. The swing is oscillating at its resonant frequency and the simple movements of the child efficiently transfer energy to the system. The resonant frequency depends on the size, shape and thickness of the material.

7) Resonant Magnetic Coupling

Magnetic coupling occurs when two objects exchange energy through their varying or oscillating magnetic fields. Resonant coupling occurs when the natural frequencies of the two objects are approximately the same. Two idealized resonant magnetic coils, shown in yellow. The blue and red color bands illustrate their magnetic fields. The coupling of their respective magnetic fields is indicated by the connection of the color band.

B. Transmitter section

The source of DC voltage supplies the DC voltage at input of DC/AC Inverter, which is given with relay used to make or break the connection. Then the AC voltage is given to the split transformer which splits the voltage & provide the voltage as our requirement , the splitting of voltage depends on the ratio of transformer then the voltage is given to transmitting inductor(copper coil) & the voltage flow through this coil is in the form of electromagnetic waves which is then transmitted towards receiving inductor

C. Receiver section

The receiving inductor (copper coil) is used to receive the electromagnetic waves which produces the voltage inside the coil which is in AC form. This voltage passed through rectifier & filter circuitry which converts the AC voltage in DC form & removes the unwanted contents using filter. This circuit used to provide smooth DC voltage. The received voltage may be in unregulated form which must be regulated using voltage regulator so at the output we get regulated DC voltage.

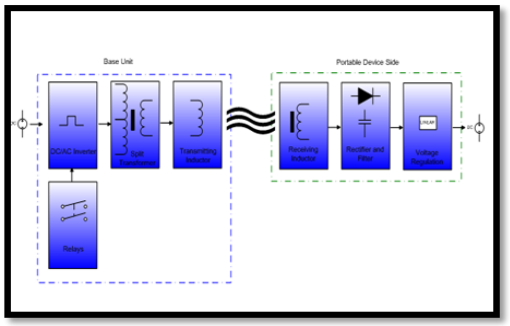

Fig. 1. Block diagram

Power supply is most important part of our project +5 volt regulated power supply is required with current rating 500 Ma.

1. *Step down transformer* – The first part of our block diagram is step down transformer which is used to step down the voltage at required voltage.
2. *Rectifier unit* - Rectifier unit is used to converting AC in to pulsating DC due to its property of conducting current in one direction only therefore semiconducting diode is used as rectifying element.
3. *Filter circuit* – The output of rectifier circuit is connected to the input of filter circuit A filter circuit is placed in between rectifier voltage regulator the output of rectifier is pulsating DC so the filter circuit is converting pulsating DC in to pure DC
4. *Three terminal voltage regulator* – Voltage regulator is used in circuit to provide constant voltage regardless of change in load current. For our project we used 7805 voltage regulator IC

D. Components

Microcontroller - The ATmega8535 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing instructions in a single clock cycle, the ATmega8535 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

LCD - Liquid Crystal Display (LCD) displays temperature of the measured element, which is calculated by the microcontroller. CMOS technology makes the device ideal for application in hand held, portable and other battery instruction with low power consumption.

P.C.B. making - P.C.B is printed circuit Board which is of

insulating base with layer of thin copper-foil. The circuit diagram is then draw on the P.C.B. with permanent marker and then it is dipped in the solution of ferric chloride so that unwanted copper is removed from the P.C.B, thus leaving components interconnection on the board.

Resistor – Resistor is an electric component that limits or regulates the flow of electric current in electronic circuit. A device is used in electrical current conduction to control the direction of current flowing to a circuit by both controlling the flow of current differently.

Capacitor – A capacitor is an electrical device that has in DC circuit the purpose of storing energy, it stores an electrical charge. two capacitor is used in circuit 100 micro-farad and 10 micro-farad.

Coil – We formed two coil winding in square shape which produce fluxes according to faradays law of electromagnetic induction principle and the power in transmit from one coil to another coil according to this law.

Battery – The 12-volt power supply is given to circuit through battery.

E. Advantages

- Less losses
- Pollution free
- Light weigh vehicle
- Electrically safe
- Less time required
- Charging is convenient
- Low maintenance cost
- Compact in size
- Quick operation

3. Future scope

With a maturing technology base and a broad application space, wireless power transfer will become prevalent in many areas of life in the coming years. Electric vehicle, both plug – in hybrid and full battery electric vehicle, will soon offer wireless charging so that plugging it to charge will no longer be a requirement. Development of worldwide standards for wireless power in both of these application areas is under way to ensure interoperability across products and brands

4. Result

In this project the maximum distance between two vehicles could be 1.5m, i.e. the power can be transferred by one vehicle to another vehicle is placed at 1.5m. The power can be transferred upto 12v.

5. Conclusion

This paper presented a review of wireless charging of electric vehicles. it is clear that vehicle electrification is unavoidable because of environment and energy related issues. Wireless charging will provide many benefits as compared with wired charging. In particular, when the roads are electrified with wireless charging capability, it will provide the foundation for mass market penetration for electric vehicle regardless of battery technology. With technology development, wireless charging of electric vehicle can be brought to fruition. Further studies in topology, control, inverter design, and human safety are still needed in the near term.

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