Wireless Charging System for Electrical Vehicle

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Abstract— Now a day's world is shifting towards electrified mobility to reduce the pollutant emissions caused by nonrenewable fossil fueled vehicles and to provide the alternative to pricey fuel for transportation. But for electric vehicles, traveling range and charging process are the two major issues affecting its adoption over conventional vehicles. With the introduction of Wireless charging technology, no more waiting at charging stations for hours, now get your vehicle charged by just parking it on parking spot or by parking at your garage or even while driving you can charge your electric vehicle. As of now, we are very much familiar with wireless transmission of data, audio and video signals so why can't we transfer power over the Air. Thanks to great scientist Nikola Tesla for his limitless amazing inventions in which wireless power transfer is one of them. He started his experiment on wireless power transmission in 1891 and developed Tesla coil.

Keywords: Wireless Charging, Transmitter Coil, Receiver Coil

I. INTRODUCTION

Basic principle of wireless charging is same as *transformer* working principle. In wireless charging there are transmitter and receiver, 220V 50Hz AC supply is converted into low voltage, High frequency alternating current and this high frequency AC is supplied to transmitter coil, then it creates alternating magnetic field that cuts the receiver coil and causes the production of AC power output in receiver coil. Then finally, this AC power at receiver side rectified to DC and fed to the battery to charge battery effectively.

Here we implement dynamic wireless charging stations. As the name indicates here vehicle get charged while in motion. The power transfers over the air from a stationary transmitter to the receiver coil in a moving vehicle. By using DWCS EV's travelling range could be improved with the continuous charging of its battery while driving on roadways and highways. It reduces the need for large energy storage which further reduces the weight of the vehicle.

A. Inductive Wireless Charging System (IWC)

The basic principle of IWC is *Faraday's law of electromagnetic induction*. Here wireless transmission of power is achieved by mutual induction of magnetic field between transmitter and receiver coil. When the main AC supply applied to the transmitter coil, it creates AC magnetic field that passes through receiver coil and this magnetic field moves electrons in receiver coil causes AC power output. This AC output is rectified and filtered to Charge the EV's energy storage system. The amount of power transferred depends on frequency, mutual inductance and distance between transmitter and receiver coil.

II. MYTHOLOGY

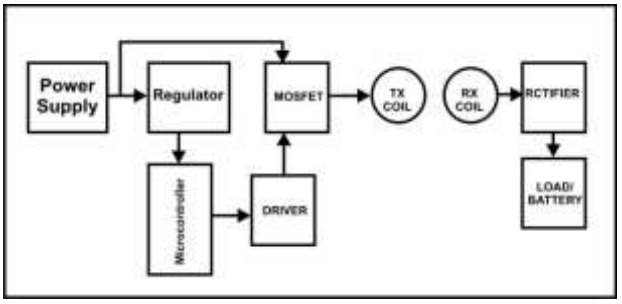


Fig. 1: Block diagram

In this system we have two main things i.e. transmitter & receiver coil. Initially we give power supply to the primary side of 12v with the help of adapter. This i/p is given to the regulator IC which convert 12v into 5v & give it to the microcontroller. We stored the power into storage capacitor & used it when we need excess power supply. Also we used filter capacitor to remove hysteresis loss when it occurs. Then there is a potentiometer which is used to control duty cycle. There are different resistances are used to control the current flow. 8v power supply is given to the MOSFET which will convert the dc current into ac & give it to transmitter coil. as current flows through it, flux generated in primary coil & According to the faradays law of electromagnetic induction, emf induced in secondary coil also & we get ac o/p in secondary side which is pulsating to convert it into pure ac again we used filter capacitor. Finally this ac o/p is converted into dc with the help of bridge rectifier & fed to the battery of ev. We can also connect the external load to the receiving end of system if needed.

Sr. No.	Item 1	Item 2	Item 3	Item4
1	Adapter	Filter Capacitor	Storage Capacitor	Regulated IC
2	Potentiometer	Transistor	MOSFET	RESISTORS
3	LED	Bridge Rectifier		

Table 1: Component List

Fig. 2: Wireless charging system for EV

Fig. 2 shows the wireless charging system for EV. Here, we are using PCB for designing. Above fig. shows two coils. One is transmitter coil and another is receiver coil and there are different components we used on PCB for this process. At last we will measure its output voltage and current with the help of multimeter.

III. DESIGN

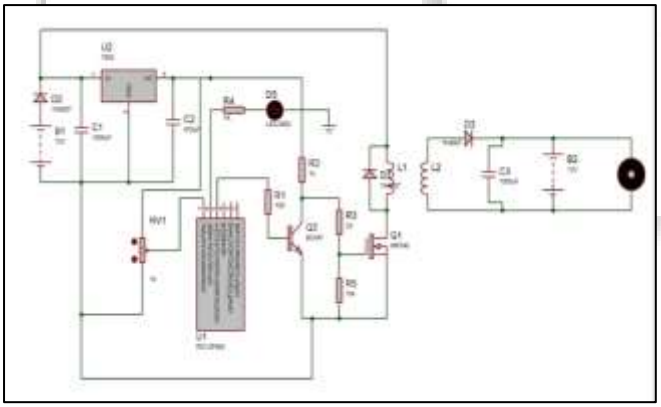


Fig. 3: Circuit diagram

Above fig (3) shows the circuit diagram for wireless charging of electrical vehicle. Where initially we are giving dc power supply of 12v to the circuit with the help of adapter. Then we used 7805 regulated IC of 5v which has 3 pins out of which pin 1 is connected to power supply but this pin is not directly connected to power supply we used one diode(D1) between them which is 1N4007of 1A. That pin 1 is also connected to filter capacitor(C1) OF 1000uf & pin3 of IC i.e. output pin of IC is connected to storage capacitor(C2)of 470uf for the storage purpose. C1 & C2 capacitors are grounded through pin2 of IC which is ground pin.

The output pin of IC is connected to the potentiometer of 10k ohm and its output is grounded. Here, we used PIC microcontroller of 5v which has total 10 pins out of which here we used pin no. 5,6 & 7. Where, pin 7(GPIO 0) of microcontroller is connected to potentiometer while pin 6(GPIO 1) is connected to LED of 1.2v through the resistance of 1k ohm which is grounded. Then pin 5 (GPIO 2) is connected to transistor(Q2) which is BC 547 of 32v – 100Ma via resistor R1 of 100ohm and collector terminal of transistor is connected to output of regulator IC via R2 resistor of 1k ohm while emitter terminal is grounded. Again collector terminal of transistor is connected to MOSFET(Q1) which is IRF540 of 55v-20A via R3 resistor of 22 ohm & R5 resistor of 10k ohm which is grounded. Here, source terminal of MOSFET is grounded and drain terminal of MOSFET is connected to primary side coil called as transmitter coil L1 through diode D2 (1N4007). This coil has 240 turns.

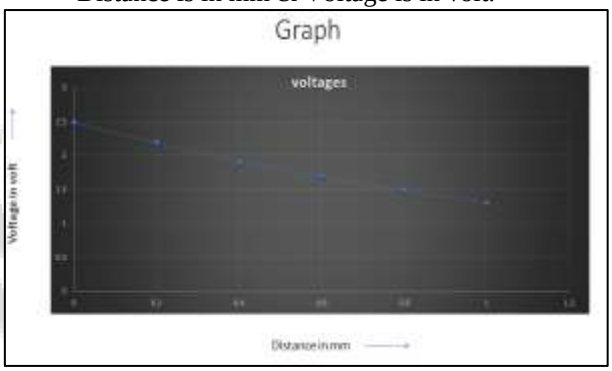
In secondary side, there is receiver coil L2 which has 160 turns which is connected to capacitor C3 of 1000uf through D3 diode (1N4007) & at last it is connected to LED and we get output voltage and current when it is connected to load.

IV. OBSERVATION TABLE

Distances	0	0.2	0.4	0.6	0.8	1.00
voltages	2.5	2.2	1.9	1.7	1.5	1.3

Where,

Distance is in mm & Voltage is in volt.



V. CONCLUSION

Thus our group actively coupled with project, and we develop this project named as "WIRELESS CHARGING SYSTEM FOR E VEHICLE".

Output will be 12v-1.5A and its efficiency is 55%. It run satisfactly with distance of 1 cm for demo purpose. We can also select voltage variations by using variable resistor.

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