JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

WIRELESS CHARGING SYSTEM FOR EVs

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Abstract: This paper presents a wireless electric vehicle charging technology, there is no more need of waiting at charging station for an hour or more, through this charging technology we can get our vehicle charged just by parking it on parking spot and most importantly even while driving the electric vehicle gets charged. Electric vehicles have now hit the road worldwide and are slowly growing in numbers. Apart from environmental benefits electric vehicles have also proven helpful in reducing cost of travel by replacing fuel with electricity which is way cheaper. Long charging time – 1-3 hours required for charging, non-availability of power for charging stations in off city and remote areas. Here we develop an EV charging system that solves both these problems with a unique innovative solution. The main motive of this project is to fabricate a prototype of an Electric Vehicle that gets charged wirelessly while in motion. Hence, reducing the dependency on the fossil fuels which are available in limited amount in the nature. This wireless charging technology would help in the uninterrupted travel without the need to stop for charging.

Keywords— Electric Vehicle, ChargingTechnology, Environmental Benefits, Reducing Cost etc.

I.INTRODUCTION

Now a days world is shifting towards electrified mobility to reduce the pollutant emissions caused by non-renewable 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 it's adoption over conventional vehicles. With the introduction of Wire 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. In 1901 with the primary goal to develop a new wireless power transmission system Tesla started developing the Wardenclyffe Tower for large high- voltage wireless energy transmission station. The saddest part is to satisfy Tesla's debts, the tower was dynamited and demolished for scrap on July 4th 1917Basic principle of wireless charging in which there are transmitter and receiver, 220V 50Hz AC supply is converted into 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. But the important thing for efficient wireless charging is to maintain the resonance frequency between transmitter and receiver. To maintain the resonant frequencies, compensation networks are added at

both sides. Then finally, this AC power at receiver side rectified to DC and fed to the battery through Battery Management System (BMS).

II. THEORITICAL BACKGROUND

Growing concern in the reduction of the polluting emissions due to the transportation means has led to the adoption of vehicles powered by comparatively cleaner sources of energy, such as batteries, fuel cells and so on, in place of internal combustion engine (ICE) based vehicles. Differently from ICE vehicles, electric vehicles (EVs) are not a matured technology in terms of vehicle autonomy, and a lot of research efforts is being carried out by academia and industries to improve the overall performance of these vehicles. Various solutions are being adopted

Battery

Fig.1

to increase the autonomy of the vehicles such as conceiving batteries of higher energy density, relaxing the batteries during acceleration are regeneration by supplying and absorbing the current peaks by means of supercapacitors, arranging fast chargers, charging while on move etc. Onboard batteries are typically recharged at home or at stations/parking places through conductive battery chargers. Generally two types of conductive battery chargers are used: off-board and on-board. On-board chargers can be used to charge from the utility outlet at home or at charging stations during the day time. Offboard chargers operate like a gas station and are designed to manage high powers in order to perform a fast charge. In most of the battery chargers the power flows only from the utility grid to the battery, and for this reason they are often termed as unidirectional battery chargers (UBCs); beside circuital simplicity, UBCs enjoy a reduced grid interconnection and lower battery degradation. On other hand, some battery chargers manages power .

III. SYSTEM REQUIREMENT

Hardware Required

Solar

A solar cell panel, solar electric panel, photo-voltaic (PV) module, PV panel or solar panel is an assembly of photovoltaic cells mounted in a framework for generating energy. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of solar cells is called a PV panel, and a system of PV panels is called an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.A solar battery can be an important addition to your solar power system. It helps you store excess electricity that you can use when your solar panels aren't generating enough energy, and gives you more options for how to power your home. If you're looking for the answer to, "How do solar batteries work?", this article will explain what a solar battery is, solar battery science, how solar batteries work with a solar power system, and the overall benefits of using solar battery storage.

Transmitter and Receiver Coil

Wireless charging needs two kinds of coils named the transmitter coil and the receiver coil. The receiver coil will collect power from the transmitter coil while going over it in the means of mutual induction. But the variation of distance between two adjacent coils affects the wireless power transfer (WPT).

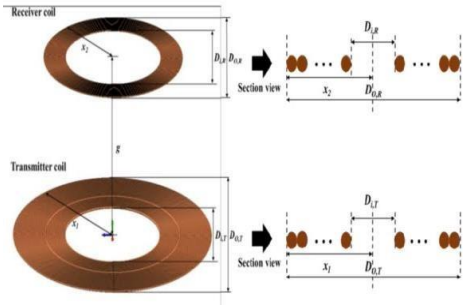

Fig. 2

Arduino

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.[4] It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

Fig.3

Converter

The feature of EV that uses electric as primary source provides benefits to customers. As electrical system is the major appeal of an EV, the present study focuses on the charging system where it involves DC-DC converter for high voltage charger. The phase-shifted-full bridge and LLC are used in high power application.

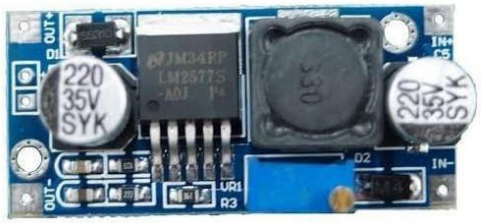

Fig.4

LCD Display

Liquid crystal display (LCD), electronic display device that operates by applying a varying electric voltage to a layer of liquid crystal, thereby inducingchanges in its optical properties. LCDs are commonly used for portable electronic games, asviewfinders for digital cameras and camcorders, invideo projection systems, for electronic billboards,as monitors for computers, and in flat-panel televisions.

Fig. 5

IV. SYSTEM OPERATION

The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, Arduino controller and LCD display to develop the system. The system demonstrates how electric vehicles can be charged while moving on road, eliminating the need to stop for charging. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The DC power now needs to be converted to AC for transmission. For this purpose we here use a transformer. The power is converted to AC using transformer and the regulated using regulator circuitry. This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle.When the vehicle is driven over the coil's energy is transmitted from the transmitter coil to ev coil. Please note the energy is still DC current that is induced into this coil. Now we convert this to DC again so that it can be used to charge the EV battery. We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input voltage using and Arduino microcontroller and display this on an LCD display. Thus the system demonstrates a solar powered wireless charging system for electric vehicles that can integrated.

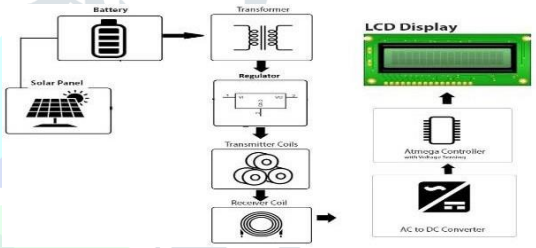

Fig. 6

V. EXPERIMENTAL RESULT

A wireless charging system for Electric Vehicles using solar energy was designed .We created a prototype of wireless charging system for Electric Vehicles. Electric vehicles use electricity to charge their batteries instead of using fossil fuels like petrol or diesel.

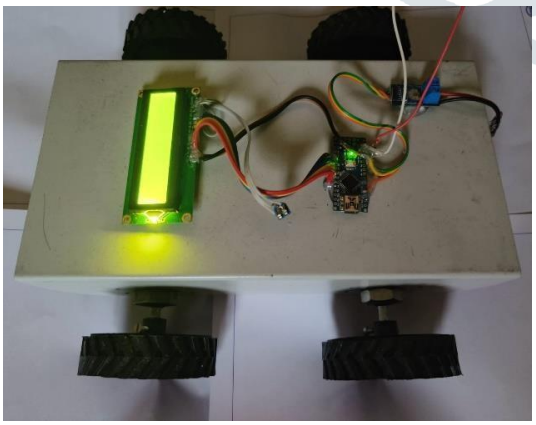

Fig. 7

VI. CONCLUSION

The use of WPT systems for EVs was the focus of this article. The key components of the WPT were studied with respect to the comsensation topology and the coil construction. The key result of this study is concerned with the static and dynamic modelling of the proposed WPT method. A new model is developed and defined that incorporates both static and dynamic problems. On laboratory work, this model was experimentally validated. The results obtained were satisfactory and confirmed the effectiveness of the reported observations. This was done all over a single receiver coil. The mutual inductance enhanced value determines the efficiency. Furthermore, having two coil receivers under the EV is an upgrade to the methodology and it was discussed in detail. The mutual inductance is an important parameter in the WPT scheme. As a result, the considered one or two coils cases were

extended to derive the used mutual inductance values. An assessment tech-unique was addressed, and the two cases were compared and conclude.

VII. REFERENCES

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