ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

Contactless Charging of E-Bike Using Solar Power

P. Rizwana Begum[1], Mr. J. Daniel Sathyaraj[2], Dr. A. Ravi[3], P. Sowpakiyasankari[4].

Student, Department of Electrical and Electronics Engineering, Francis Xavier Engineering College, Tirunelveli, India[1, 4]

Faculty Member, Department of Electrical and Electronics Engineering, Francis Xavier Engineering College, Tirunelveli, India[2, 3]

ABSTRACT: Nowadays, Inductive Power Transfer (IPT) represents a widely investigated issue with respect to modern battery charging methods, by providing a wireless solution. IPT is applied across a large variety of applications, from W to KW power levels. Although IPT features great benefits in terms of safety and comfort, the most significant drawback consists of relatively poor power conversion efficiency. In this project, wireless charging equipment for E-bikes with Improved efficiency and less charging time. The contactless charging of E-bike is useful in the development of modern days and consume energy from a renewable resource. This way of charging is a very promising technique and future cooperation with e-bike manufactures or the energy bus group for standardization will be the finishing touch. A proto type model was developed to validate the given benefits.

KEYWORDS: Wireless battery, Solar power, Microprocessor.

I. INTRODUCTION

Nowadays, research is focused on renewable energy sources and energy saving to reduce fossil fuel consumption and emission. Moreover, to reduce air pollution electric vehicles are widely promoted. In this field, important issues are diagnostic systems to improve power train reliability. For automotive applications, inductive power transfer-based battery charging is gaining great popularity over wired-based charging. Inductive Power Transfer (IPT), based on magnetic coupling, can be exploited to address energy from the electric mains to the electric load. The magnetic coupling occurs by means of two coil windings: the power transmitter winding, connected to the mains, is the primary inductor; the power receiver winding, connected to the load, is the secondary inductor.

IPT-based battery charging for a vast range of power targets is a widely researched issue. Consumer handheld devices and electric vehicles represent some of these applications. For all cases, covering the range from Watt to Kilowatt power levels, the most important advantages brought by the IPT-based wireless battery charging are safety and comfort. Indeed, by avoiding power cords, electrocution danger is prevented. Moreover, if the wireless solution is employed, battery charging is automatically provided by only placing the load device next to the magnetic pad which transmits the required power. In spite of the benefits linked to the wireless charging solution, the conventional wire-based recharge is still more convenient as far as power conversion, efficiency is concerned. Accurate measurements of input and output power and efficiency as well are required since the simulation step even by PC-based wattmeter. Even if for low power applications, such as mobile phones, wireless battery charging systems are fully available on the market, for high power levels, such as in automotive systems, widespread commercialization is still far to come. Research is therefore focused on efficiency-related issues aiming at reducing consumption from the electrical mains, especially if Kilowatt power levels are interested. In the literature, several innovative solutions for different power levels aim at enhancing the magnetic coupling efficiency of the inductive structure and of the power conversion stages. In prototypes of Kilowatt contactless charging systems with reference to efficiency, issues are presented. The wireless method gives the opportunity of battery charging while the vehicle is in motion. In the literature, advanced technologies

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

for wireless dynamic charging are investigated. In this paper, a 100W IPT-based wireless charging system which is addressed to electric bicycles batteries and improving the overall power conversion efficiency is proposed. The IP-based charging method is particularly appropriate for E-bikes, due to the small amount of stored electric charge among all the electric vehicles. Urban cyclers generally need automatic and fast charging operations: IPT would allow charging by only parking the bicycle in a proper space. The design procedure of the magnetic structure is thoroughlyanalysed.Threedifferent IPT solutions are compared through the magnetic field simulation tool and the best choice in terms of cost, weight and magnetic coupling are explained. Power electronics systems are properly designed, too. Results of electronic simulation tests are provided to show the efficiency of the proposed architecture. Very high efficiency is achieved by the designed IPT system, exceeding the 90% value. Although the proposed Inductive Power Transfer system is specifically addressed to a 100Watt E-bike battery recharge, it can be conveniently adapted to Kilowatt prototypes for all-electric vehicles charging.

II. OBJECTIVES OF PROPOSED WORK

- To charge the e-bikes without any physical contacts like adapters using PV panels.
- Our perspective of project is acontactless charging of a bike using PV cells.
- Keypad system in the project are used for the security operation.

III. LITERATURE SURVEY

[1] WIRELESS BATTERY CHARGING: E-BIKE APPLICATION.
*AUTHOR NAME:*F. Pellittere, V. Boscaino,A. O. Di Tommaso,R. Micele, G. Capponi.
In this paper, we studied about inductive power transfer and battery charging techniques. In this paper 100W wireless charging equipment for E-bike which improves efficiency is proposed.

[2] AN OVERVIEW OF EXISTING EXPERIENCES WITH SOLAR POWERED E-BIKE.
*AUTHOR NAME:*Georgia Apostolou, Angele Reinders, Karst Geurs.
In this paper, we specially focus on a new type of E-bike, so called `Solar powered E-bike'.

[3] WIRELESS POWER TRANSMISSION TRENDS.
AUTHOR NAME: Mohammad Shidujaman, Hooman Samani, Mohammad Arif.
In this paper, wireless power transmission has been attracting a wide range of subjects in various fields and also become a highly active research area because of their potential providing high technology to daily life.

IV. EXISTING SYSTEM

PV cell is a panel used for the conversion of solar energy into electrical energy for energy consumption. The electric bikes are modern usable bikes for the reduction of pollution. In the previous proposals, electric bikes are getting charged through a solar panel with the help of transmitting cables, plugs etc., The solar panel generates the power and stored in a battery for the energy storing purposes and later it can be used for a charging or other purpose. In the modern days, usage of electric bikes is increasing rapidly but they requirea power connector for charging their bikes. The usage of an electric bike power cables play a major role but the user cannot carry the cables all the time and fixing of solar panel in bikes acquires large space and it will increase the weight of the bike. Batteries are around 90% efficient when charging and much the same when discharging

The main disadvantages are the weight and cumbersome nature of even the smallest panels, and the potential screening effect of roadside buildings and trees, the rider, and of coursevehicle orientation. In other words, if the panel is not angled towards direct sunlight for most of the journey, there is little point in carrying them.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

V. PROPOSED SYSTEM

In the previous proposals, the electric bike gets charged through a PV panel with the help of power cables. In our project, we developed the charging system without the use of power cables or plug. The "CONTACTLESS CHARGING OF E-BIKE USING SOLAR POWER" transmits power by using the principle of mutual inductance. The wireless power transfer module in our system contains both transmitting and receiving end for the transmission of power. The coils present in both transmitting and receiving ends transfer the power from the PV cells to an electric bike. The transfer module contains a number of turns in both the coils. The coil present in the project transmits power for a minimum range.

It can be used in electronic equipment 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 the stable 5Vto12V output voltage and maximum 500mA output current. Its small size and insulation coil are more suitable for use in a wireless project. 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 6V. The second induction coil takes power from the electromagnetic field and converts it back into electrical current to the receiver circuit that outputs 5V to 12V,600Ma.

VI. COMPONENTS USED

- PIC Microcontroller
- Relay
- LCD Module
- Keypad Interfacing
- Object Sensor
- Voltage Sensor
- 6V Solar Pavel
- 6V Battery
- Wireless Power Transfer Module

VII. METHODOLOGY

A two 6V PV panel is used in the system. Here two 6V panel gets serially connected for generating a required power. The maximum voltage in a 6V panel is 6-7.5V and the maximum current is 270millamps. The required amount of voltage and current for a 6V battery cannot be generated by a 6V panel. So, the two 6V PV panel is connected in series. Therefore, by using a 12V panel, the potential difference is developed between the battery and the panel.

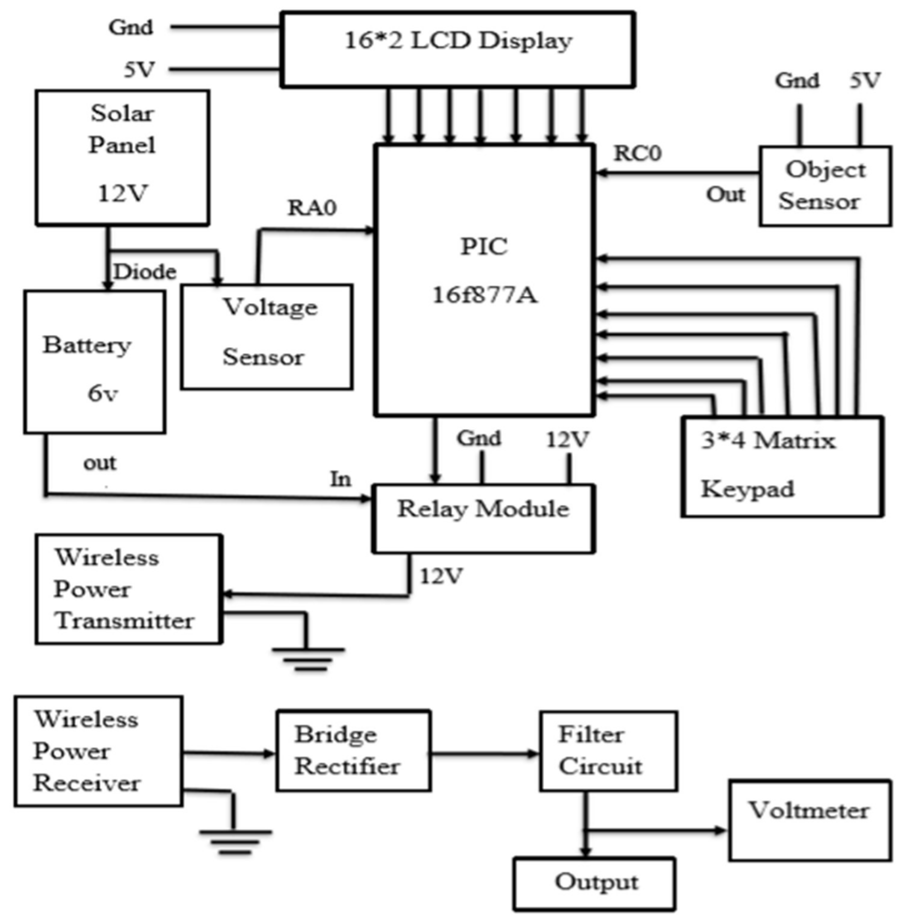
ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020



A 12V solar panel is connected with a 6V battery by which the generated power gets stored in the battery. The battery is connected with a voltage divider through which 6V gets converted into 5V and passed on the voltage to the PIC microcontroller. The LCD module connected with a PIC microcontroller starts operating. Here 16*2 LCD Module used. It can display 2 lines and 16 characters. LCD gets connected with the microcontroller in PORTB. Here two IR led's are used, one as a transmitter and other as a receiver. Transmitter passes an IR ray to the object and the receiver receives the reflected signal through which the sensor gets operated.The object sensor connected with the controller senses the object and displays in the LCD. Then the controller request for a password to generate a signal for the operating function. The keypad connected with the controller is used to proceed with the password for the security function to undergone an operating function. The relay in the system gets turned ON by the signal generated by the controller. Once the relay gets operated, the wireless transmitter transfers the power to the wireless receiver module. The power transmits through the wireless module gets stored in the battery and the output displays through a voltmeter. A wireless transfer module contains two transistors, Transistor 1 is used for switching 25 positive cycles and Transistor 2 is used for switching 25 negative cycles. By this operation, the DC source is converted into an AC source. Thus, the converted AC signal is fed to the coil. The coil in the system has 40 turns of the winding.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

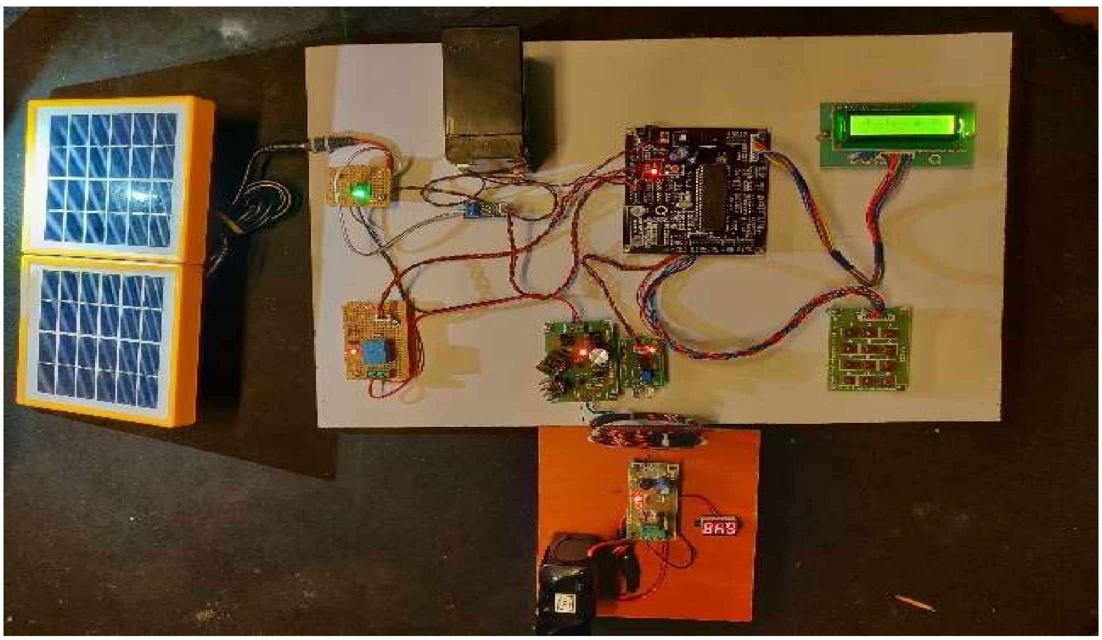
(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 9, Issue 2, February 2020

VII. RESULT

A prototype module was designed for contactless charging of e-bike with a 12V, 10W as output. A voltage divider is used to prevent the PIC microcontroller. In the PIC microcontroller, Voltage regulator regulates the 6V into 5V. The 5V is given to other components like LCD, Keypad, Relay, Object sensor and Wireless transfer Module. When the object sensor detects the object, 5V relay turns ON the wireless transfer module.The receiving coil receives the 12V and passed on to the battery of receiving end. The voltmeter in the receiving end displays the Output Voltage.



VIII. CONCLUSION

In this project a detailed design of Inductive Power Transfer system for a 5 Watts e-bike battery charging is presented. Magnetic coupling structure and micro controller have been accurately designed through MIKRO C PRO and PICkit2 PROGRAMMER software tools. Proper operation of the system and powerconversion efficiency have been executed. An experimental prototype of the designed inductive coupling structure has been assembled in order to validate the inductive coupling related results.A prototype module was designed for contactless charging of e-bike with a 12V, 10W as output to verify the use of Inductive Power Transfer in modern battery charging methods. The prototype validates the advantages of Inductive Power Transfer.

REFERENCES

[1] V. Boscaino, F. Pellitteri, R. La Rosa, and G. Capponi, “Wireless battery chargers for portable applications: design and test of a high-efficiency power receiver”, IET Power Electronics, vol. 6, pp. 20–29, 2013.
[2] G. Cipriani, V. Di Dio, D. La Manna, F. Massaro, R. Miceli IEEE Member, and G. Zizzo, “Economic Analysis on Dynamic Photovoltaic Systems in New Italian Feed in Tariffs Context”, IEEE 2013.
[3] Georgia Apostolou, Angèle Reinders and Karst Geurs, “An Overview of Existing Experiences with Solar-Powered E-Bikes”, Energies 2018.
[4] Liguang Xie, Yi Shi, Hou, Y.T. Lou, A., "Wireless power transfer and applications to sensor networks," Wireless Communications, IEEE, vol.20, no.4, pp.140,145, August 2013.
[5] Mohammad Shidujaman, Hooman Samani, Mohammad Arif, “Wireless Power Transmission Trends”, 3rd International Conference on Informatics, Electronics & Vision 2014, IEEE 2014.

[6] Mohammed.S, Wireless power transmission a next generation power transmission system. International Journal of Computer Applications, 1(13), 100103. 2013.
[7] Y. Nagatsuka, N. Ehara, Y. Kaneko, S. Abe, and T. Yasuda, “Compact contactless power transfer system for electric vehicles,” in Power Electronics Conference (IPEC), 2010 International, pp. 807-813, 2010.
[8] F. Pellitteri, V. Boscaino, A. O. Di Tommaso, R. Miceli, G. Capponi, “Wireless Battery Charging: E-bike Application”, IEEE 2013.
[9] Schneider, D., "Wireless power at a distance is still far away", Spectrum, IEEE, vol.47, no.5, pp.34,39, May 2010.
[10] Tomar, A.,and Gupta, S, Wireless power Transmission: Applications and ComponentsInternational Journal of Engineering, 2015.