SOLAR POWERED INDUCTION WIRELESS CHARGING OF AN ELECTRIC VEHICLE

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ABSTRACT

Considering a future scenario in which a driverless Electric Vehicle (EV) needs an automatic charging system without human intervention. In this regard, there is a requirement for a fully automatable, fast, safe, cost- effective, and reliable charging infrastructure that provides a profitable business model and fast adoption in the electrified transportation systems. These qualities can be comprehended through wireless charging systems.Wireless Power Transfer (WPT) is a futuristic technology with the advantage of flexibility, convenience, safety, and the capability of becoming fully automated. In WPT methods resonant inductive wireless charginghas to gain more attention compared to other wireless power transfer methods due to high efficiency and easymaintenance.

INTRODUCTION

Large scale deployment of Internal Combustion Engine (ICE) based vehicles in transport system lead to the release of harmful fumes into an atmosphere lead to global warming and climate change, which is main concern of global community. Therefore, to lessen dependence on fossil fuel-based energy sources and to reduce its harmful impacts on the atmosphere, there is a need for alternative solutions such as EVs charged on renewable energy sources. Normally, batteries have low energy density, makes them weighty, costly. bulky. In addition, slow in charging and provides shorter lifetime. Now a days lithium-ion batteries are mostly used in EVs. Battery capacity restrictsthe cruise range. Adding the batteries will increase the cruise range, which further increase the weight and cost ofthe vehicle. Some authors presented fast battery charging methods to minimize the full charging time less than hours. However, available fast charging systems are costly and complex in control. Still, the charging time of battery more than time that needs to refuel a car based on fossil fuel. Another solution proposed is based on the use of ‘‘swapping stations,’’ where the depleted EV batteries are exchanged with fully charged batteries. For the development of EVs, charging systems are playing the main role.

METHODOLOGY

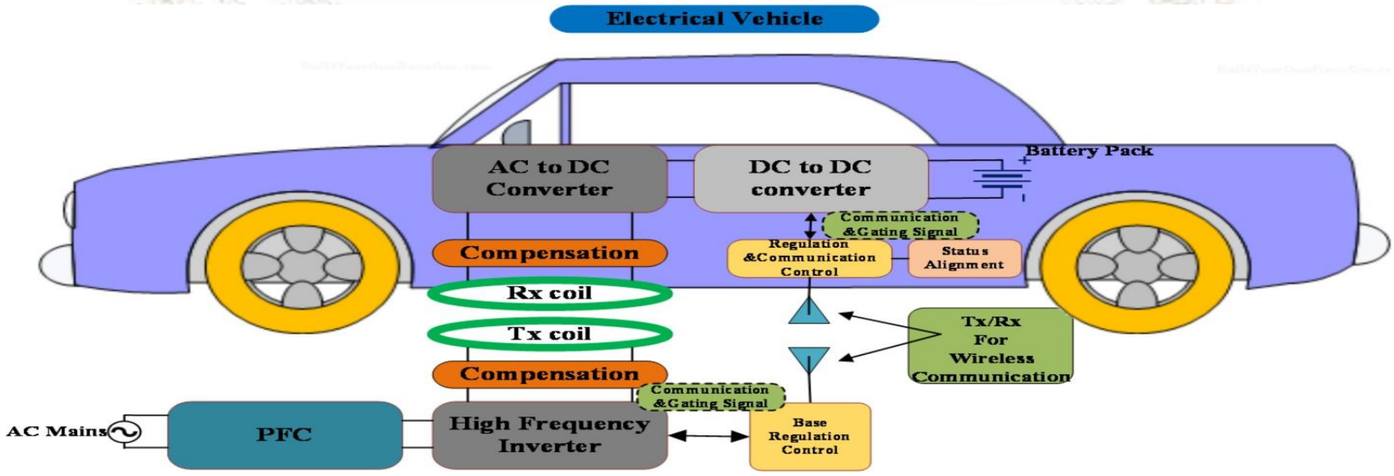

Fig.1 Methodology

BLOCK DIAGRAM

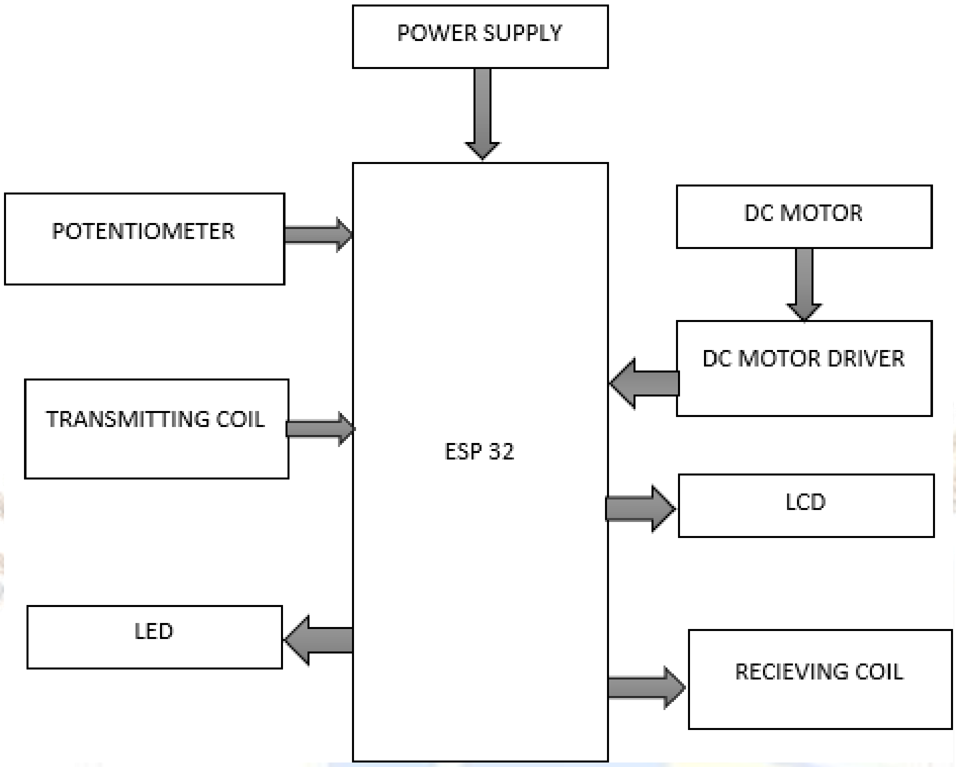

Fig.2 Block Diagram

WORKING PRINCIPLE:

Basically, the DC supply is generated from the Solar grid. So, in order to produce the magnetic flux in the induction coil it as to converted to AC. So, produce AC will be fed to the power factor correction (PFC) in order to reduce the fluctuation in the power system and due to the power factor correction again it has been converted to DC. This DC is passed through the high frequency inverter in order to control the AC system so here as I said the obtained supply from the grid will be DC it has to become converted to AC to provide the magnetic flux in the induction charging. Again, hear it has been converted to AC in order to transmit the power wireless the supply as to be in AC here the induction charging takes place when the current is passed through the primary coil or transmitting coil it creates the magnetic field. Due to the action of this another current takes place in secondary coil or receiving coil and this where the induction charging takes place without any physical contact Full bridge rectifier utilizes full cycle DC this full bridge rectifier converts the complete cycle of AC into pulsating DC. The charges store in the battery while vehicle moving.

TRANSMITTING COIL AND RECEIVING COIL

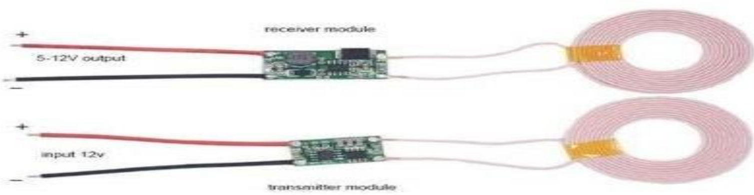

Fig.3 Transmitting & Receiving Coil

SPECIFICATIONS : Transmitting & Receiving Coil

- Model: XKT-412.
- Input Voltage: 12V.
- Output Voltage: 5V.
- Operating Current: 1.2-2 A
- Receive Coil: 3mm, the receiver output 5V / 1A current.

Wireless charging coils are used for inductive charging and wireless charging. Wireless charging coils are installed into a device for the purpose of receiving a wireless signal that will be used to charge and power another device. They are a popular method for charging smart phones and tablets as they are not required to be plugged in, like a traditional charger. The coil is optimised for inductive charging. Wireless charging coils use an electromagnetic field between two devices to transfer energy. There are two functions, a transmitter and a receiver, with one beaming the field and the other receiving it. Fig shows The transmitter and receiver must be on the same frequency. Please note that only devices with a compatible battery that will accept this type of charging.

LITERATURE SURVEY

Ref No.	Title	Authors	Year of Publication	Findings	Outcomes
[1]	Inductive Power Transfer for Electric Vehicle Charging	Emrullah Aydin , Mehmet Timur Aydemir , Ahmet Aksoz.	2022	Energies	This paper focuses on the Inductive Power Transfer (IPT) method, which is based on the magnetic coupling of coils exchanging power from a stationary primary unit to a secondary system onboard the EV. A comprehensive review has been performed on the history of the evolution, working principles and phenomena, design considerations, control methods and health issues of IPT systems, especially those based on EV charging.
[2]	Wireless Power Transfer Charging for Electric Vehicles	Aganti Mahesh, Bharatiraja Chokkalingam 1 , (Senior Member, IEEE)	2021	IEEE	This literature presents a review of the status of Resonant Inductive Wireless Power Transfer Charging technology also highlighting the present status and its future of the wireless EV market. First, the paper delivers a brief history throw lights on wireless charging methods, highlighting the pros and cons. Then, the paper aids a comparative review of different type's inductive pads, rails, and compensations technologies done so far. The static and dynamic charging techniques and their characteristics are also illustrated

[3]	Inductively Coupled Power Transfer for Continuously Powered Electric Vehicles	Zeljko Pantic, Sanzhong Bai and Srdjan M. Lukic	2009	IEEE	In this paper, we describe Economic and environmental issues are main motivation for developing efficient and sustainable electrical vehicle for urban transportation. Electrical vehicles (EV) have two main advantages compared to hybrid and gasoline vehicle: eliminated tailpipe emissions and simplified drive-train
[4]	Modern Advances in Wireless Power Transfer Systems for Roadway Powered Electric Vehicles	Chunting Chris Mi, Fellow, IEEE, Giuseppe Buja, Life Fellow, IEEE	2016	IEEE	The power transfer capacity, efficiency, lateral tolerance, EMF, air-gap, size, weight, and cost of the WPTSs have been improved by virtues of innovative semiconductor switches, better coil designs, roadway construction techniques, and higher operating frequency
[5]	Power Converter Topologies and Control Methods for Electric Vehicle Fast Charging Applications	MD SAFAYATULLAH , MOHAMED TAMASAS ELRAIS	2022	IEEE	This paper presents a comprehensive review of EV off-board chargers that consist of ac dc and dc-dc power stages from the power network to the EV battery. Although EV chargers are categorized into two types, namely, on-board and off-board chargers, it is essential to utilize off-board chargers for dc fast and ultra-fast charging so that volume and weight of EV can be reduced significantly
[6]	Modelling, Analysis, and SS Compensation of the Tripolar Structure of Wireless Power Transfer (WPT) System for EV Applications	Behnam M. Mosammam, Mojtaba Mirsalim	2020	IEEE	This paper analyses and models the tripolar pad (TPP), as new structure that has been proposed recently and applies it to series-series (SS) compensation in two scenarios and compares their results to find the best. For the proposed method of compensation, the calculation formulas of the output characteristics are discussed and presented. Also, in following, a new improved structure is proposed which helps to reduce the practical costs

[7]	Model Predictive Control to Maximize the Efficiency in EV Wireless Chargers	Jose M. Gonzalez-Gonz	2021	IEEE	this paper presents a predictive control algorithm focused on maximizing the charging efficiency. As a novelty, the algorithm sets three configuration parameters in the power converters of the system. The main advantage lies in the fact that it does not need constant monitoring and offers very low response times.
[8]	A Coil Detection System for Dynamic Wireless Charging of Electric Vehicle	Devendra Patil, John Miller, Babak Fahimi	2017	IEEE	A major challenge in implementation of dynamic wireless power transfer (DWPT) is automatic detection of EV to avoid loss in efficiency and alleviate any safety concerns. This paper proposes a novel coil detection method for segmented DWPT. Detection of the EV ahead of its arrival will initiate energizing of the transmitter buried inside the road to enable justin-time transfer of power.
[9]	Economic Analysis of the Dynamic Charging Electric Vehicle	Seungmin Jeong, Student Member, Young Jae Jang	2015	IEEE	A wireless charging or inductive charging electric vehicle (EV) is a type of EVs with a battery that is charged from a charging infrastructure, using a wireless power transfer technology.
[10]	Design of a Single-Stage Inductive-Power-Transfer Converter for Efficient EV Battery Charging	Zhicong Huang, Siu-Chung Wong	2016	IEEE	This paper studies wireless charging of lithium-ion batteries for electric vehicles. The charging profile mandates a constant current (CC) charging for a discharged battery until the battery voltage reaches the cut-off voltage at ratedpower

CONCLUSION

Wireless technology is currently undertaking intense research in both academia and industry, due to their reliable, convenient, and efficient charging with minimum human interaction. Higher efficiency compared to plug-in charger is one of the main goals of the WPT charging systems. Future improvements of WPT technologies are going to determine the full scale commercialization and automation of wireless charging system.

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