Dynamic Wireless Electric Charging System Matlab Simulink

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Abstract- *Electrified transportation will contribute to the reduction of greenhouse gas emissions and the stabilization of gasoline costs. To promote adoption of electrified transportation, a diverse network of charging stations must be established in a user-friendly environment. Wireless electric vehicle charging systems (WEVCS) have the potential to be a viable alternative technology for charging electric vehicles (EVs) that do not need a plug. This article discusses the present state of wireless power transfer technologies for electric vehicles. Additionally, it contains wireless transformer constructions that have been studied using a range of ferrite forms. WEVCS are linked with health and safety concerns, which have been addressed in recent international standard development. Two main applications, static and dynamic WEVCS, are discussed, and current development is documented using features from research labs, universities, and industry. Additionally, future concepts-based WEVCS are evaluated and studied, including "vehicle-to-grid (V2G)" and "in-wheel" wireless charging systems (WCS), with qualitative comparisons to other current technologies.*

Keywords- Wireless electric vehicle charging system (WEVCS), Electric vehicles (EVs)

I. INTRODUCTION

Wireless Charging Systems (WCS) have been suggested for stationary applications involving high-power vehicles, such as electric cars (EVs) and plug-in electric vehicles (PEVs). In contrast to plugin charging methods, WCS offers additional benefits in terms of simplicity, dependability, and use. The disadvantage or restriction of WCS is that they may be used only while the vehicle is parked or in stationary mode, such as at car parks, garages, or at traffic signals. Furthermore, stationary WCS have a number of difficulties, including electromagnetic compatibility (EMC) concerns, restricted power transmission, bulkier designs, shorter range, and increased efficiency. To enhance the two aspects of range and battery storage capacity, the dynamic mode of operation of the WCS for EVs has been investigated. This technique enables battery storage devices to be charged while the vehicle is moving.

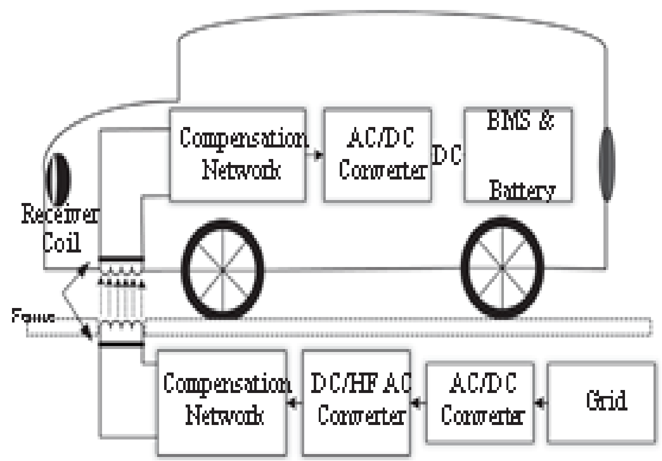


Fig.1.1. Basic block diagram of static wireless charging system for EVs.

1.1 Basic operatingprinciple

Fig. 1 depicts the fundamental block diagram of the static WCS for EVs. To facilitate power transfer from the transmission coil to the receiving coil, the grid's alternating current (AC) is converted to high frequency (HF) alternating current (AC) through AC/DC and DC/AC converters. On both the transmitting and receiving sides, compensatory topologies based on series and parallel combinations are used to increase overall system efficiency. The receiving coil, which is usually placed underneath the vehicle, transforms the oscillating magnetic flux fields to high-frequency alternating current (HF AC). The high-frequency alternating current is then transformed to a steady direct current supply that is utilized to power the on-board batteries. To prevent any health and safety concerns and to guarantee steady operation, the power control, communications, and battery management system (BMS) are also incorporated. Magnetic planar ferrite plates are used on both the transmitter and receiver sides to minimize detrimental leakage fluxes and enhance magnetic flux distribution.

1.2 Wireless power transfer methods

Since the introduction of wireless charging systems for electric vehicles (EVs), four methods have been used to design WEVCS: traditional inductive power transfer (IPT), capacitive wireless power transfer (CWPT), magnetic gear wireless power transfer (MGWPT), and resonant inductive power transfer (RIPT) (RIPT). The following table summarizes the wireless power transfer methods available for battery-powered electric cars (BEVs).

Capacitive Wireless PowerTransfer

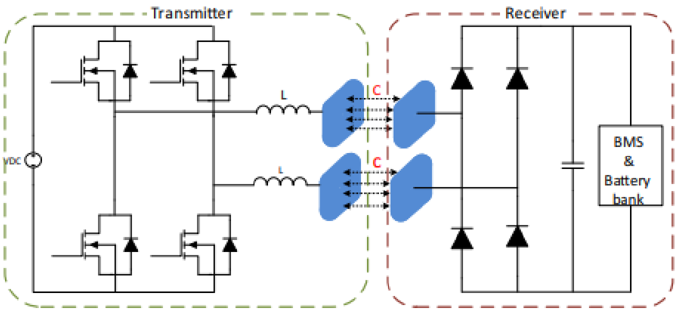


Fig.1.2. Schematic diagram of Capacitive Wireless Power Transfer

The cheap cost and simplicity of CWPT technology, along with the sophisticated geometric and mechanical structures of coupling capacitors, makes it ideal for low-power applications such as portable electronics devices, mobile phone chargers, and spinning machinery. Fig. 1.2. illustrates a typical schematic design of a CPWT based on a series resonant circuit. Instead of coils or magnets, coupling capacitors are used to transmit power from the source to the receiver in the CWPT.

Problem Statement:

The project is created with the goal of improving the system operating revenue by optimizing SEV charging and relocation strategy in the face of continually changing user demands and power costs in the EVCS system.

OBJECTIVE

- To study and review different charging technique of electricle vehicle.
- To develop electric vehicle using MATLAB Simulink.
- To develop road for charging of electric vehicle.

II. LITERATURE REVIEW

1. Huan Ngo, et.al. , "Optimal positioning of dynamic wireless charging infrastructure in a road network for battery electric vehicles"[2020].

In this research, Dynamic wireless charging (DWC) may extend the range of battery electric vehicles (BEVs). Installing DWC is costly, thus its location must be optimum. In actuality, choosing the optimal location of DWC units within a network is a typical challenge. This article proposes a sequential two-level planning strategy that considers both public infrastructure planners and BEV users. The overall system travel duration and total system net energy use are assessed. Planners must also consider agency finances, range assurance, and resource distribution equity. According to the planner's arrangement of DWC facilities, BEV drivers choose their favorite route. We employ a fast solution approach that can handle large-scale real-world networks. An optimal placement of DWC infrastructure may save societal costs and energy usage.

2. Muhammad Adil, et.al. "A Reliable Sensor Network Infrastructure For Electric Vehicles to Enable Dynamic Wireless Charging Based on Machine Learning Technique"[2020].

This article suggests a hybrid method of dynamic wireless charging (DWC) for electric vehicles (EV's). The hybrid solution proposed here enables DWC in EVs. The network infrastructure for participating EVs uses the Enhanced-DSDV protocol. The Charge Condition Estimator (CSE) was used as an unsupervised machine learning approach to comprehend each EV's current charging state. Similarly, CSE data is transferred through upgraded DSDV routing via networked wireless nodes. In a DWC setting, each participating EV may also charge another EV in the network. Each EV has a dashboard panel to allow drivers to monitor nearby EVs and acquire information about their current charge level, location, and distance. Each EV also has a magnetic field generator that allows magnetic coupling between paired EVs in a wireless environment. The proposed model's feasibility was thoroughly tested in DWC. The results show that the proposed system is DWC static and dynamically dependable. Improved packet loss ratio and delay of enhanced-DSDV routing protocol over existing approaches.

3.Altynay Smagulova, et.al. , "Simulation Analysis of PI and Fuzzy Controller for Dynamic Wireless Charging of Electric Vehicle"[2020].

This article evaluates PI and Fuzzy controllers for dynamic wireless charging of electric cars. These two controllers employ a 12 V DC-DC buck-boost converter. The proposed dynamic WPT designs were validated using graphical programming simulations. The controllers under consideration output current, voltage, and power signals smoothly. The PI controller produces ripple-free current, voltage, and power. It settles more slowly. The Fuzzy controller, on the other hand, quickly converges the output parameters to the reference parameters, but with a small steady-state inaccuracy The PI and fuzzy controllers employed in this study reduce the ripple ratio from 40% to virtually 0% and 5%. Eliminating ripples prevents overheating and early degradation of the battery. So both controllers keep the system running smoothly independent of the input signal's transients and reduce the pulsation ratio.

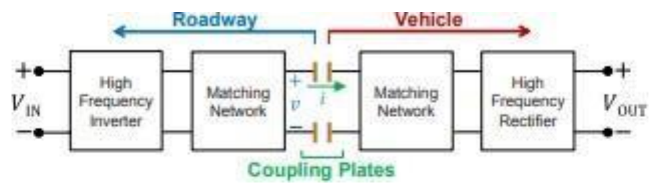
4. Partha Sarathi Subudhi, et.al. , "Wireless Power Transfer Topologies used for Static and Dynamic Charging of EV Battery: A Review"[2020].

This article analyzes WPT charging topologies for EV batteries. This article discusses inductive static charging of EV batteries, focusing on cores, compensation topologies, converters, and controllers. The ICPT technique is the most efficient system architecture among all static inductive wireless EV battery charging topologies. Also covered are the design elements and circuit analysis of an ICPT-based WPT system. The compensatory topologies and number of plates used in the system's construction are assessed. The CPT system with six plates LCL compensation mechanism is preferred among the possible topologies. The page discusses the primary charging pad design, compensatory topologies, and core types. The article addresses the WPT system's problems and possible improvements to help researchers establish a wireless charging solution for EV batteries**.**

III. METHODOLOGY

Capacitive Power Transfer (CPT) system has been introduced recently as an attractive alternative to the traditional inductive power transfer method. This is due to the CPT benefits of simple topology, fewer components, better EMI performance and robustness to surrounding metallic elements. Wireless power transfer (WPT) is emerging as a practical means for electric vehicle (EV) charging. High capacitive coupling is achieved through a conformal (flexible and compressive) foam transmitter bumper that molds and contours itself to the vehicle to minimize air gap duringcharging.

The architecture of a capacitive WPT system for EV charging is shown in Fig. 3.1. This system achieves wireless power transfer using two pairs of conducting plates, one pair embedded in the road and the other attached to the underside of the vehicle chassis, with the two pairs separated by a large air gap. An inverter converts the dc input voltage into high frequency ac, which is fed into a resonant matching network those steps up the voltage. This creates a high voltage at the road side of the coupling plates, enabling high power transfer with low displacement currents, and thus relatively low fringing fields. On the vehicle side of the coupling plates is a second resonant matching network that steps the current up (and the voltage down) to the level required to charge the EV battery. Furthermore, both of the matching networks provide reactive compensation for the coupling plates‟ capacitive reactance. Finally, a high-frequency rectifier interfaces the system to the EV‟sbattery.



3.1 Capacitive WPTArchitecture

Fig. 3.1: Architecture of a large air-gap capacitive WPT system suitable for EV charging applications. The system comprises two pairs of coupling plates, a high-frequency inverter and rectifier, and matching networks that provide voltage or current gain and reactive compensation.

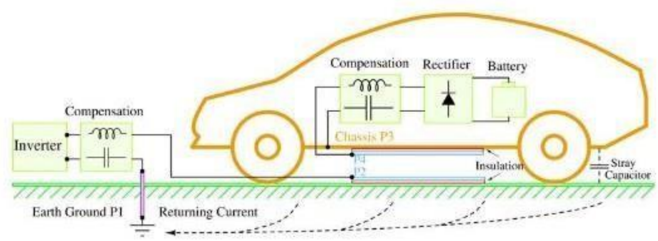


Fig.3.2. Structure of a CPT system in the electric vehicle charging application

At the primary side, an inverter is used to provide ac excitation to the resonant circuit, and a compensation network can establish resonances with the capacitive coupler, which contains two metal plates. The vehicle chassis and earth ground are also involved in the power transfer process to simplify the system structure, and the circuit parameters are designed to reduce the voltages on the vehicle chassis for safe operation.

IV. RESULT AND DISSCUSSION

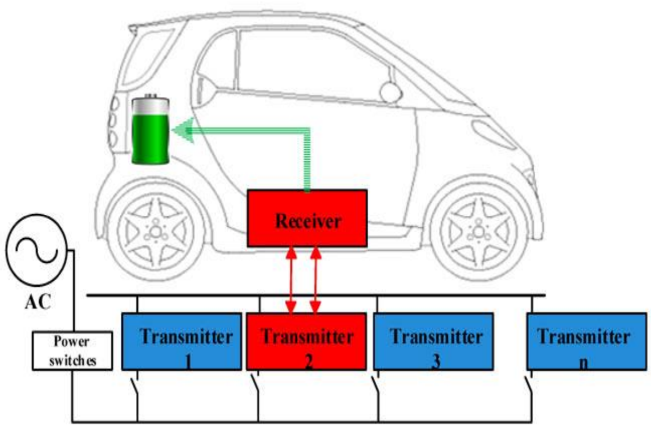


Fig. 4.1 Dynamic-Wireless-Charging-System

This figure shows The wireless transmission of energy between transmitter and receiver is done by the use of displacement current generated by variations in the electric field. Instead of magnets or coils as transmitters and receivers, coupling capacitors are employed in this application for wireless power transfer. The alternating current voltage is initially delivered to the power factor correction circuit in order to increase efficiency, maintain voltage levels, and decrease losses when transferring power. The current is then supplied to an H-bridge for the generation of high-frequency alternating current voltage, and this high-frequency alternating current voltage is applied to the transmitting plate, causing the development of an oscillating electric field, which causes displacement current at the receiver plate via electrostatic induction.

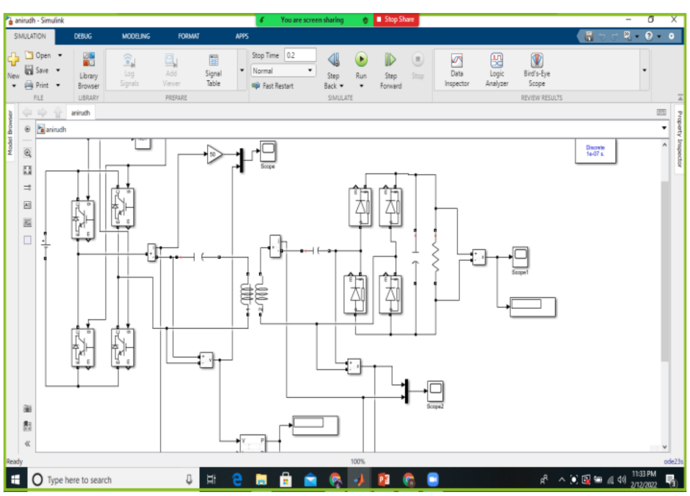


Fig .4.3 Circuit Diagram from Matlab

This figure shows the to understand by high frequency convert or invert this dc to square view type of square wave to type high frequency supply actually we have to use square wave also because square wave also convert square wave transfer a power from primary to secondary if you match but if you use ac for gated transferring the power of they are more efficient I use a square and it is a primary this circuit now so you can use.

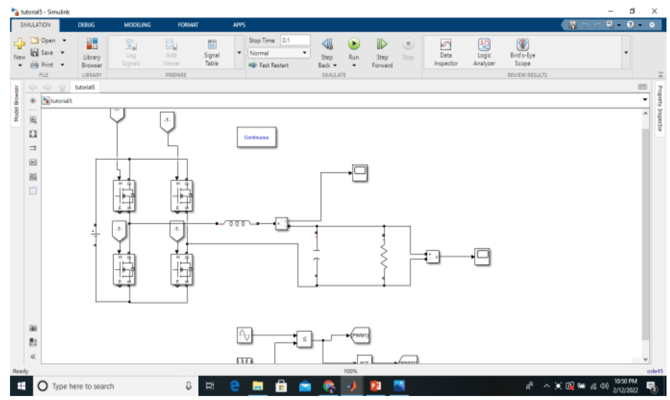


Fig.4.4 Rectifier circuit

This figure shows the so we can use to see this so it is let understand what is Rectifier circuit it is an easy when you revert to 230-volt ac supply you can get ac voltage at this load by using a by Rectifier circuit the here we get and 228 volts because rectifier drop to volt and to the inverter circuit figure show I understand circuit this circuit so volt is high frequency so now secondary have to Rectifier circuit ac to dc and we can then supply to the battery now.

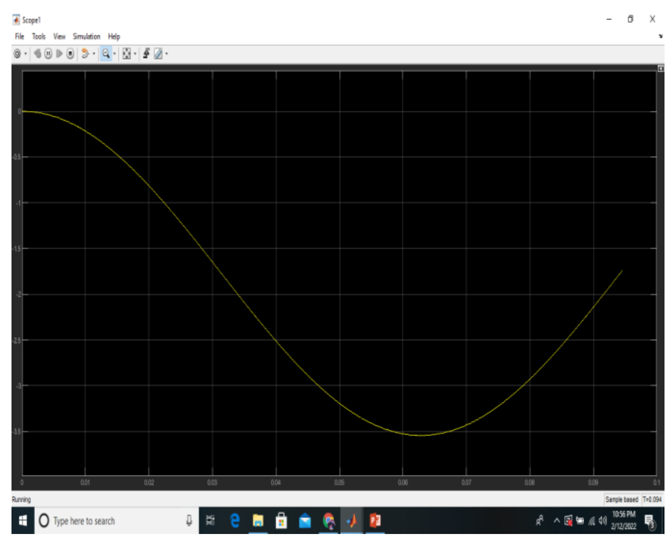


Fig.4.5 wave form Rectifier scope

This figure shown the now wave form Rectifier scope we can this type circuit diagram from mat lab and rectifier circuit cope one at we get this type of wave obviously I capacitor filter use this wave from charging this type wave from so this wave from is given to the main circuit and use and dc volt you can say the proper dc battery that we get a dc I have use to the wave from circuit this will change to type wave but I want to check a proper dc voltage than why this I use battery to the circuit now this is a wave from and pulse and generator to generate frequency near and after calculate the all component I get a frequency near to the 4105hrs it means 1 kilo hrs. and according to the time period and pulse generator to generate square wave from I will give to how the fervency is come mathematics part you understand all this if you have still so this is in which the square from waveform in this period and after constant.

V. CONCLUSION

In this WEVCS and its current research technologies for fixed and dynamic applications. The present wireless charging pad was designed using a variety of core and ferrite shapes. Health and safety concerns have been raised, as have recent modifications in international WEVCS regulations. Modern fixed and dynamic WEVCS have been studied and evaluated by a variety of public and private organizations. Finally, FEM is used to study and model developing future technologies. This page covers recent WEVCS improvements.

REFERENCES

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