

“THE PROJECT REPORT ON WIRELESS CHARGING STATION FOR ELECTRIC VEHICLES WITH A SOLAR ENERGY CHARGING ARRANGEMENT AS A BACKUP”

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ABSTRACT:-

Combining green energy sources such as solar energy with electric vehicles has grown in popularity over the last decade due to the impact on non-renewable fossil fuels and the pollution they produce. Electric vehicle (EV) charging stations can be used with solar panels to reduce the load on the controller. This study provides proof of state-of-the-art analysis of remote control transmission to charge electric vehicle batteries using solar panels to generate electricity. The purpose of this research is to expand knowledge about the wireless power transfer (WPT) framework, as well as to learn more about the solar electric car charging station. To achieve this goal, various types of solar EV charging stations have been extensively researched. After learning a few principles, the different WPT components are explored in several sections. Examination of the compensation and multiple coil models and the advantages of each coil over the others were made in the framework of wireless power transmission for solar-powered electric vehicles.

Keywords: electric vehicle, wireless charging, wireless power transfer, inductive power transfer, capacitive power transfer, dynamic wireless charging

1. INTRODUCTION :-

The concept of wireless transmission for charging and powering engines and devices has been discussed since the Tesla days. But that didn't work as there was no technical support at the time. In 2007, researchers took an important step in this direction by being able to control the light from a wireless source two meters away. Since this significant achievement, significant progress has been made in the field. One of the many other applications of wireless power transmission (WPT) is charging electric vehicles (EVs), which has many advantages and is being researched.

The term "conductive charging system" also applies to conventional wired or plug-in charging methods. There are some issues with the attached solutions. For example, they need thick charging cables and connectors. In addition, the charger must be manually connected to the power source and the product to be charged. The wired charging system is also not friendly to users and the environment. Due to factors such as temperature, ground contact, or self charging equipment, the charging line may short out or the insulation may deteriorate, resulting in electric shock. They can be used with multiple batteries, or a non-capacity battery can be replaced on a single charge as needed, shortening charging time and reducing risk. For example, if a car can travel a certain distance on one charge with some batteries, it can be increased times by using more

batteries. Alternatively, the vehicle battery can be changed to charge at the charging point while driving. But batteries also have some problems.

Batteries are heavy, initially expensive, and have a long lifespan. After a certain point, it becomes unable to carry any more batteries due to the weight. These issues will be resolved with future updates to electronic storage devices. WPT is another method that can be used to fix battery problems. For example, by using a wireless charging system, the initial cost can be reduced by avoiding large and bulky batteries. The WPT method is efficient and effective as it eliminates the clutter of cables and connectors that come with manual add-on payment systems.

With a careful review of the relevant research literature, we discuss and analyze the working ideas, strategies, materials, methods, and various aspects of EV wireless charging systems in this study.

The following list contains the main results of this study :

- Provide results and comments on relevant questions.
- Before going into details about EV wireless charging systems and the various methods used for this purpose, a brief introduction to the WPT method is given.

- Completed the review of SWCS and DWCS and provided an overview of the design process.
- The IPT-based DWCS prototype and design have been reviewed.
- Wireless charging system communication and control power management and system compatibility.

2. BLOCK DIAGRAM

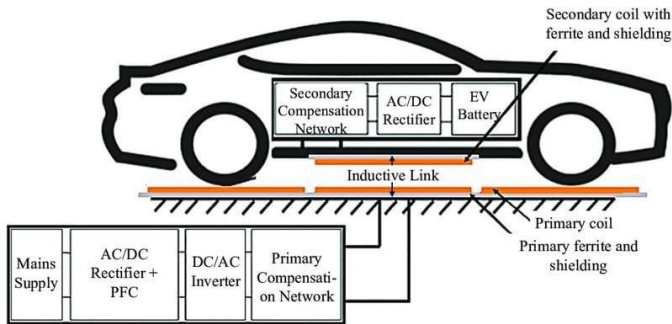


Fig. No. 1 – Block Diagram of Project

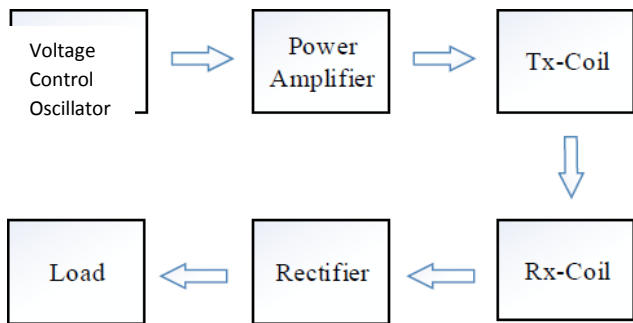


Fig. No. 2 - Wireless power transfer over a short distance is accomplished using inductive coupling. Power is transferred by use of mutual induction between two coils. The receiving antenna is made up of the secondary coil, whereas the transmitting antenna is the primary coil.

2. 1 WORKING PRINCIPLE OF TESLA COIL

Tesla coils are high-voltage transformers that are often used as transmitters for wireless power transmission. The Tesla coil is a resonant transformer, the primary and secondary LC circuits are only loosely connected. We use it as a transmitter because it's a transformer but it works differently than a normal transformer, it gives us a lot of power and a high-frequency output that produces more induction on the load side. Tesla coils use a high-voltage generator to charge a capacitor (called a primary capacitor) and temporarily store the charge. When the capacitor is fully charged and connected to a special switch

called a gap, the air between the electrodes is ionized, producing electricity.

Primary capacitors can be connected in series and parallel, the difference between and is between the primary capacitor and the primary coil, and the other end of the capacitor is connected to the high-voltage generator. The RF ground is at the other end of the first coil.

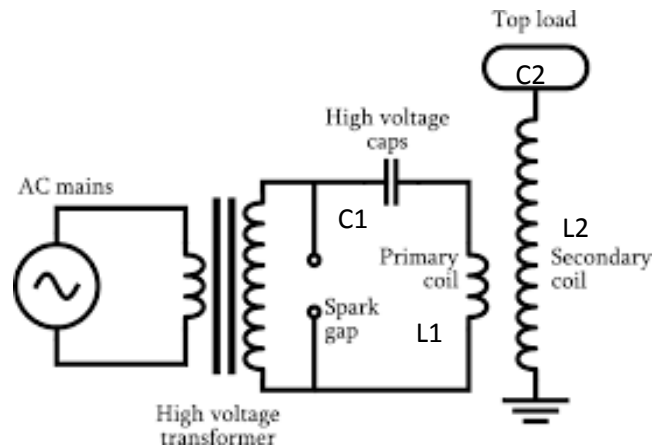


Fig. No. 3 – Tesla Coil Operation

Tesla coils are high-voltage transformers that are often used as transmitters for wireless power transmission. The Tesla coil is a resonant transformer, the primary and secondary LC circuits are only loosely connected. We use it as a transmitter because it is a transformer but it works differently than a normal transformer, giving us more power, and more frequency output, which has a greater impact on the cargo. Tesla coils use a high-voltage generator to charge a capacitor (called a primary capacitor) and temporarily store the charge. When the capacitor is fully charged and connected to a special switch called a gap, the air between the electrodes is ionized, producing electricity.

Primary capacitors can be connected in series and parallel, the difference between and is between the primary capacitor and the primary coil, and the other end of the capacitor is connected to the high-voltage generator. The RF ground is at the other end of the first coil.

2. 2 AC TO DC CONVERSION CIRCUIT

All electrical or electronic equipment must be validly powered. While Tesla coils operate at different frequencies, most of the devices we use every day operate at 50 or 60 Hertz. To keep the LC resonant frequency constant, the Tesla coil operates at higher frequencies and produces higher frequencies. Tesla coil power cannot be used directly by any device; instead, it must be converted to a form that can be used by other devices. According to

the law of conservation of energy, energy exists forever but can be changed from one form to another.

This concept also applies here. The load coils are used to capture the high frequency voltage and send it to the full power station which converts AC to DC.

Maintaining the resonant frequency of the transmit and receive coils is important for good wireless charging, so balancing is present on both sides to control the resonant frequency. A battery management system (BMS) or battery pack is used to power the battery, and at the receiver side, AC power is converted to DC power.

2.4 DEVELOPMENT OF WIRELESS CHARGING :

By replacing the cable needed with wireless charging, the losses in the cables can be eliminated. People holding the wrong cables while plugging and unplugging for charging can be dangerous. While wireless payments are efficient and time-saving, they have some drawbacks. After plug-in parking, the stationary electric vehicle is designed as a system that can charge electric vehicles (EVs) in the parking lot or in the parking lot when the vehicle is not a long way. The ability to charge electric cars while driving is very popular.

Dynamic wireless charging happens when the electric vehicle is charged while driving.

WEVCS can be divided into 2 classes: -

- 1) Static wireless charging.
- 2) Dynamic wireless charging system

2. 4. 1. STATIC WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM:

As the name suggests, it charges while the vehicle is stationary, allowing for quick and easy changing of plugs without involving the driver. In other words, since the vehicle has a wireless charging system, we can stop it and charge the battery. The transmitter is installed, the receiver is placed under the car.

Before we start charging the car, we need to plug in the transmitter and receiver. The distance between the transmitter and the receiver, the size of the pad, and the power level of the power supply all affect charging time. SWCS is recommended where vehicles are usually parked for long periods of time. The distance between traffic lights should be between 150-300 mm. SWCS can be installed in parking lots, office buildings, residential, shopping malls and other places.

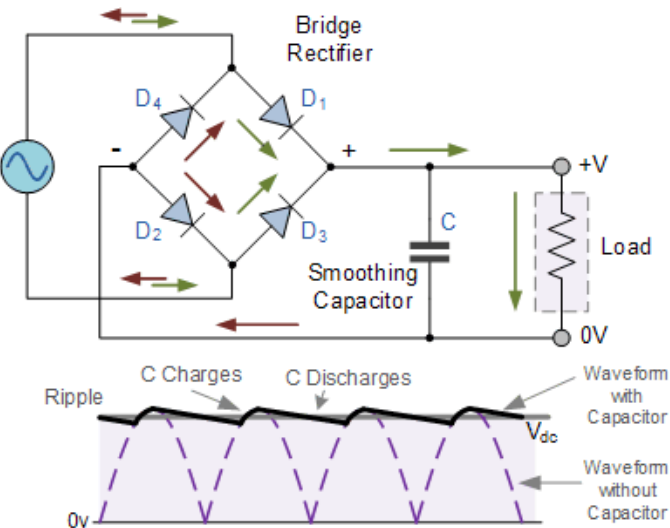


Fig. No. 4 – Full Bridge Rectifier and its O/P Waveform

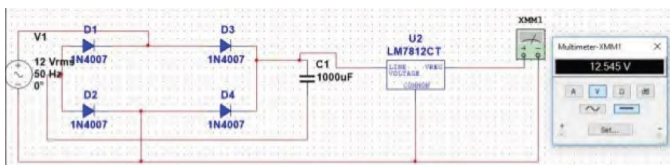


Fig. No. 5 – Schematic Arrangement of Full Bridge Rectifier

The details of all bridge rectifiers are done sharply and vividly. Figure 5 shows a schematic diagram of a complete rectifier bridge converting AC voltage to DC voltage; Figure 4 shows the circuit configuration of the full bridge rectifier. In our project, this AC-DC converter was used twice, once to supply DC voltage to the load LED at the receiving end and once in the oscillator circuit.

2. 3 BASIC WORKING PRINCIPLE :-

The operation of the transformer and wireless charging are the same. There are wire coils and receiver coils used in wireless charging. Through AC/DC and DC/AC converters, the 220V 50HZ alternating current of the electrical grid is converted into high-frequency alternating current, which is sent to the transmitting coil. Create alternating magnetic flux, disconnect the receive coil, and have the receiver coil combine the AC output.

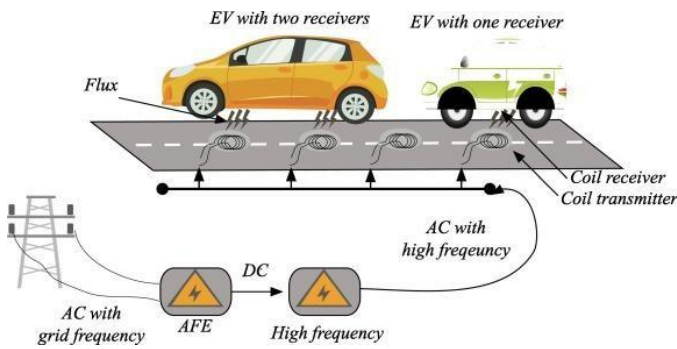


Fig. No. 6 - static wireless electric vehicle charging system

2. 4. 1. DYNAMIC WIRELESS CHARGING SYSTEM [DWCS]:-

When it comes to electric cars, wireless charging technology, which charges the car on the go, represents the pinnacle. It has been successful when it comes to wireless charging technology. The power and range of electric vehicles are the focus. Dynamic wireless charging will help boost the vehicle's charge and keep the battery charged while the vehicle is driving on and off the highway. It also reduces the need for a large power reserve and further

reduces the weight of the vehicle. From a transmitting station to a receiving coil, energy is transmitted through the air.

3. ADVANTAGES AND DISADVANTAGES

3.1 ADVANTAGES

- Ecologically Friendly
- Compared to a similar gas-powered vehicle, operating costs are lowered by 80%.
- There are no fuel costs.
- Less maintenance is required than for a gas-powered vehicle.
- Pollution-free and lightweight vehicles
- Electronically Secure
- Charging is practical
- Infinite range and instantaneous charging.
- Multiple EVs can be charged simultaneously.
- Quieter than standard automobiles in nature

3. 2 DISADVANTAGES

- Limited range and power
- It's expensive

4. Results :-

Wireless power transfer for electric car using ATmega328 microcontroller can be done by different methods such as inductive coupling or resonance coupling using ic555 circuit, and power MOSFET circuit with primary and secondary coil works well. The results of this project will depend on characteristics such as efficiency, range and power transfer capacity, as well as specific usage and design options. It is important to consider the safety, EMI, and overall performance of the system. The result will depend on the success of hardware integration, firmware programming, energy storage for the EV battery on both sides where the coils are energized, and this car is solar powered, both wireless and solar energy is stored in the battery. Another explanation of the project is how long the battery lasts. This process will be done with the operation of the ATmega328 microcontroller.

5. FUTURE SCOPE

- The city and country should prepare to have electricity in the future. It is based on the instructions of the authorities and the latest technology. Offering the best performance, safety, and economy, electric vehicles have the potential to change the way transportation.
- Dynamic electric car charging is essential; The technology could also power biomedical implants, enable supersonic hyperloop travel, and create humanoid robots. The opportunities offered by business problems are limitless.
- Today, the electric vehicle market is growing rapidly. WEVC may become more competitive as new technologies and equipment are developed.
- Power electronics can also benefit from advanced equipment. In addition to leakage currents, switching losses are another important energy waste in WEVC systems. Static WEVC can release workers after removing the job from the ledger, but not the pay change.

6. CONCLUSION

- In this study, wireless charging of electric vehicles was investigated. Wireless charging for electric vehicles is the most effective technology.
- Wireless charging has many advantages over wireless charging. Due to his extensive travels. It reduces the time required to charge the car and even allows charging EVs on the go.
- Although the initial cost is high, the cost of treatment will decrease over time. It is used more frequently due

to its superiority over traditional cable systems can reduce the effect of power and reduce power loss by using WCEV.

- It is predicted that the world will be completely wireless in the future. Wireless charging has many advantages over wireless charging.
- With further advancements in technology, wireless charging of electric vehicles could become a reality. Inverter design control, topology, and personal safety still need further research in the short term.

7. REFERENCES

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