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Wireless Charging of Electric Vehicles Using Solar and Grid

Anjali Shinde, Vaibhav Sutar, Aarati Tandale, Shubham Upadhye, Prof. P.S.Magdum
Student, Dept. of Electrical Engineering, D.K.T.E Society's Textile and Engineering Institute, Ichalkaranji, India
Asst. Prof. Dept. of Electrical Engineering, D.K.T.E Society's Textile and Engineering Institute, Ichalkaranji, India

Abstract:

This paper presents an electric vehicle wireless charging system. Due to advantages over its wired version, such as the lack of exposed wires, simplicity of charging, and fearless transmission of power in hazardous environments, wireless charging is appealing for these applications. Some businesses are interested in using it to recharge an electric vehicle's onboard batteries, and work is being done to build and enhance various related topologies. The process of wireless charging uses a low-cost inductive coupling between two coils known as the transmitter and reception coils. Inductive wireless charging of the resonant type is frequently used for medium, high-power applications like EV charging since it exhibits superior efficiency. Transmitter coils are buried in the road and receiver coils are installed in vehicles in EV charging applications.

Introduction:

The world's population is growing, and with it, so is the electricity demand. Thus, the most crucial component of today's power system is the efficient and controlled utilization of electricity. The majority of the power system involves the wired transfer of power, which results in an extremely significant loss. Wired power transmission and distribution alone are responsible for around 30% of the overall power loss. The resistance of cables during transmission is the primary cause of this loss.

Composite overhead conductors and underground cables using high-temperature

superconductors can increase the efficiency of wired transmission. Nevertheless, the gearbox

is still ineffective. The world's largest percentage of losses are in India's electricity grid.

Given that Wireless Power Transfer employs a wireless means of communication, it may be a good alternative to reduce these losses. Theft of electricity has also grown to be a serious issue. Power theft losses are rising quickly in India, and wired gearboxes may even be encouraging it because the wired gearbox is more susceptible to power theft. Wastage of electricity is a major concern in the power system in addition to losses. We can't control the wastage of electricity using technical knowledge since sources like home appliances and government buildings are affected by human psychology. Instead, they need awareness. A wireless power transfer system that feeds a street light system with energy from a vehicle's battery. Any road often has more than a thousand vehicles using it every day. Street lights on that route may be powered by the energy we collect from each vehicle without interfering with its operation. is a viable approach to stop these losses.

Scope of research:

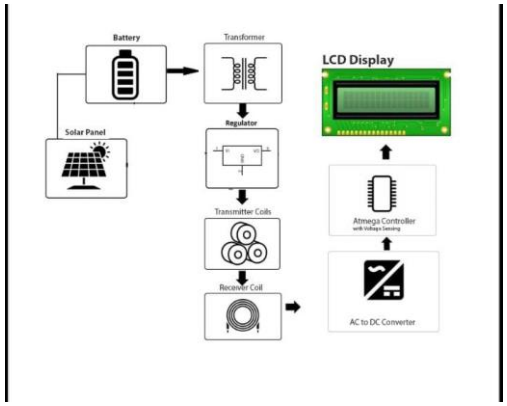
- To study the wireless energy transfer technique
- Reducing the cost of wired connectivity

- To implement prototype hardware for contactless bidirectional ev charging unit using transmitting and receiving coil
- Grid through charging.
- lessen the need for big, heavy batteries.
- There is no need to stop using it to charge because it can charge continuously.
- This also aids in lowering pollutants.

***Keywords*:**

PV panel, Transmitting receiving coil, grid

BLOCK DIAGRAM:



***Hardware Requirements*:**

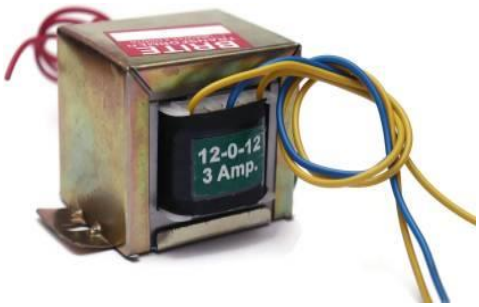
Solar panel

A solar panel is an assembly of photovoltaic solar cells installed in a (often rectangular) frame. It is sometimes referred to as a photovoltaic (PV) module or PV panel. Sunlight is used by solar panels to collect radiant energy, which is then transformed into direct current (DC) power. It is a 10W, 12V monocrystalline solar panel.

Transmitting and receiving coils

The transmitter coil and receiver coil are the two different types of coils required for wireless charging. Through mutual induction, the receiver coil will draw power from the transmitter coil as it passes over it. However, the wireless power transfer (WPT) is impacted by variations in the distance between two nearby coils.

Transformer



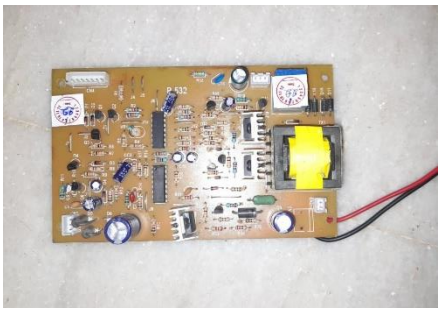
Transformers are electromechanical devices that employ the electromagnetic induction theory to adjust the voltage ratio. Through a transformer, the voltage is increased or decreased depending on the situation. The winding ratio between the primary and secondary windings determines whether a step is up or down. When supply is

provided to the primary winding, electromagnetic induction causes the flux from the primary winding to link with the secondary winding. In the project, the distribution system is demonstrated using a step-down transformer. The output current is 3A and the output voltage is 12V or 0V.

AC to DC Converter

One of the most crucial components in power electronics is AC to DC Converters. This is because many practical applications rely on these transformations. AC-DC converters are electrical circuits that convert alternating current (AC) input into direct current (DC) output.

Inverter



A steady DC power source that can provide adequate current for the system's planned power demands is needed for a conventional power inverter device or circuit. Smaller consumer and business inverters typically operate at 12 V DC and are powered by rechargeable 12 V lead acid batteries or car electrical outlets.

Atmega Controller

Temperature Sensor

In this project, we are using an atmega 328p controller. The innovative RISC design of the ATmega328P, an 8-bit AVR microcontroller with excellent performance and low power consumption, allows it to execute 131 strong instructions in a single clock cycle. It is frequently used as a processor in Arduino boards like the Fio and Uno. With 23 programmable I/O lines and 32k bytes of onboard self-programmable flash program memory, it is immediately functional without the need for extra computing components.

MOSFET(IRF3205)

For this project, we used the MOSFET model IRF 3205. A high current N-Channel MOSFET with a switching capacity of up to 110A and 55V, the IRF3205. The MOSFET's unique selling point is its ultra-low on resistance of just 8.0mΩ, which makes it ideal for switching circuits like inverters and DC-DC converters.

Battery

An apparatus that stores chemical energy and transforms it into electrical energy is a battery. Electrons move from one substance (electrode) to another through an external circuit during chemical reactions in batteries. An electric current can be created by the flow of electrons and employed to perform tasks. For this project, we are using 4 lithium-ion batteries with a rating of 3.7v each.

Working and circuit diagram

Solar panels, batteries, transformers, regulator circuits, copper coils, AC to DC converters, atmega controllers, and LCDs are all used in the system's construction. The method shows how electric vehicles may be charged while traveling down the road, doing away with the need to pull over. The converter receives solar DC power. Now that the DC power is ready for the gearbox, AC conversion is required. For this reason, a transformer is used. A transformer is used to convert the power to AC, and regulator circuitry is used to regulate it. The copper coils that are utilized for wireless energy transmission are now powered by this energy. The electric car has a copper coil installed underneath. the coils are crossed by the vehicle Driven over the coils by the vehicle, energy is communicated between the receiving coil and the transmitter coil. So that it can be utilized to recharge the EV battery, we now convert this back to DC. To convert it back to DC, we employ circuitry for AC to DC conversion. DC power. Now, we show this on an LCD screen as well. As a result, the technology shows how a wireless solar-powered charging system for electric vehicles may be integrated into the road. This is an application-based project. The application is the vehicle's top is covered with a solar panel that collects solar energy and uses it to power the house's needs.

Current rating: 15A

Advantages

- Wireless charging of vehicles without any wire.
- No need to stop for charging, vehicles are charged during running condition.
- No external power supply is needed.
- As we are using a non-renewable energy source in the form of sunlight to charge the battery

of the vehicle which is eco-friendly.

▪ Using this system in the vehicle we are not only saving depleting fuel but can also give

us contribute towards nature being free from air pollution and its causes.

Limitations

▪ Initial cost is high.

▪ Insufficient for longer distances

▪ Fast discharging of the battery.

Applications

▪ Roadside lights

▪ Traffic lights

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