IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

"WIRELESS POWER TRANSMISSION TECHNOLOGY"

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Abstract: The main objective of this project is to develop a device for wireless power transfer. The concept of wireless power transfer was realized by Nikolas tesla. Wireless power transfer can make a remarkable change in the field of the electrical engineering which eliminates the use conventional copper cables and current carrying wires. Based on this concept, the project is developed to transfer power within a small range. This project can be used for charging batteries those are physically not possible to be connected electrically such as pace makers (An electronic device that works in place of a defective heart valve) implanted in the body that runs on a battery.

Keywords: Sensors, Magnetic Resonance, Solar Power Satallite

Research Objective:-

1) To Investigate the Efficiency of Different Wireless Power Transmission Methods
2) To Analyze the Impact of Transmission Distance on Power Efficiency
3) To Optimize the Design of WPT Systems for Maximum Power Transfer
4) To Address the Environmental Impact of Wireless Power Transmission

I. INTRODUCTION

A system of WireIess Power Transfer (WPT) transmits power to the device which has to work without any wires, and is the key subsystem of the Future Fast, Flexible, Free-Flying, Fractionated (F6) System. The WPT technology is very important for the space solar power station and deep-space exploration, and it could break the limit of capability and operation for satellites and make the satellites much lighter, smaller and more flexible and durable. Moreover the WPT system could transmit power to aspacevehicIe in order to supply the power for interstellar probe. Currently, the WPT system utilizes the microwave and laser as the medium of transmitting power.

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Electricity energy will be transport by the cord for the distribution of the energy. The major issue in this type of power transmission is the losses occur when transmission and distribution process of electrical power due to the energy dissipation in the cord. The conductor and other equipment used for transmission in energy dissipation. In daily life the power generation and power loss are also increased. The cost of electricity is harmful to the environment due to the making of electricity. For reducing transmission loss is very crucial because the saved power can be used as an alternative to minimize the cost. Stored power loss during the transmission process is inevitable; some alternatives can be interpreted to solved this problem. To minimize power losses in the power distribution network with using of wireless power transmission.

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That has been known for centuries to clean sources of electricity. The patient is required to be operated every year to replace the battery. This project is designed to charge a rechargeable battery wirelessly for the purpose. Since charging of the battery is not possible to be demonstrated, we are providing a DC fan that runs through wireless power.

II. LITERATURE SURVEY

- The article discusses a wireless sensor network application system for monitoring, inspection, security, and interactive services in power transmission and distribution systems, addressing challenges and limitations of current systems.
- This study reviews wireless power transfer (WPT) for safe electric vehicle charging, addressing issues like transmission efficiency, power capacity, and electromagnetic safety, and suggests new research areas.
- In this article, we give a review of the history of wireless power transfer and describe its recent developments. We show how such technologies can be applied to sensor networks and address their energy constraints.
- The difficulties in setting up wireless sensor networks because of transmission lines' extended range and powering monitoring devices on the line are also covered in the article.
- this paper elaborates on current major research topics and discusses about future development trends. This novel energy transmission mechanism shows significant meanings on the pervasive application of renewable energies in our daily life.
- The rapid development of autonomous electronic devices such as laptops, cell phones, and other mobile electronics has generated a great interest in technologies that can wirelessly transfer relatively high power over medium range distances (approximately 0.5m to 5m).
- wireless power transmission and have been researched for decades, mid-range wireless power transfer (that can energize home and office electronics) is a relatively new field with significant potential.

III. METHODOLOGY

Wireless power transfer relies on using electromagnetic fields to transmit electrical energy from the charging pad (transmitter) to the device (receiver) without any physical wires. This technology is convenient because you don't have to plug and unplug devices – you place them on the charging pad, and they start charging wirelessly.

➢ Power Converter :

A power converter is an electrical or electro-mechanical device for converting electrical energy. A power converter can convert alternating current (AC) into direct current (DC) and vice versa; change the voltage or frequency of the current or do some combination of these.

➢ Coupling Device:

Wireless power transfer (WPT) using inductive coupling sends magnetic field power to a receiver coil. Wireless low-power transfer (WLPT) is a need for charging smart phones, electric vehicles, and other electrical gadgets. Medical implanted devices, in particular, have benefited greatly from the use of WPT

➢ Transmitter &Receiver :

When a device sends out a wireless signal, it is called a transmitter. When another device picks up that wireless signal and understands the information, it is called a receiver

➢ Bidirectional Communication :

The main structure of the system contains two dual full bridges topology to achieve bidirectional and controllable power transmission. Signal transmission is coupled into the circuit using four tightly coupling transformers (two transmitters and two receivers).

➢ Control Circuit :

Control circuits are responsible for managing the operation and coordination of industrial equipment

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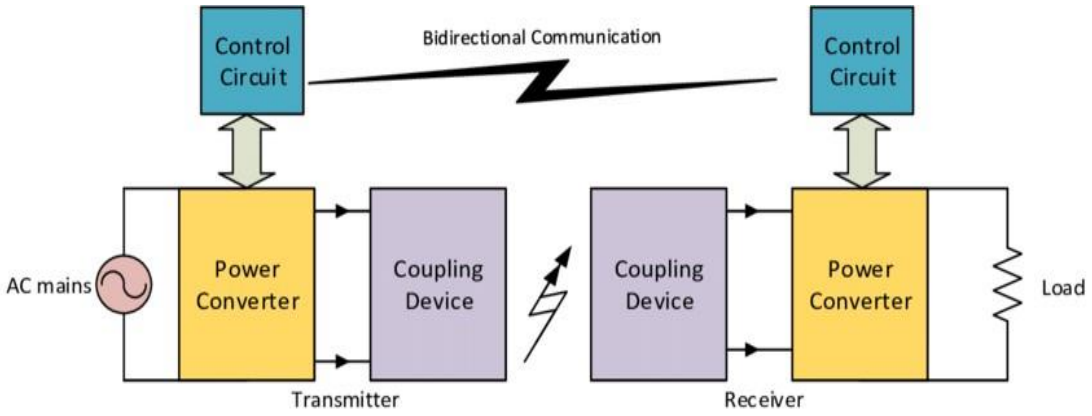

Fig.1- Circuit diagram of WPT

❖ **Types of technologies of WPT**

▪ **Near-field techniques**

i.Inductive Coupling

ii.Resonance Inductive Coupling

▪ **Far-field techniques**

i.Microwave Power Transmission

ii.LASER Power transmission

➢ **Inductive Coupling**

- Primary and secondary coils are not connected with wires.
- Energy transfer is due to mutual induction

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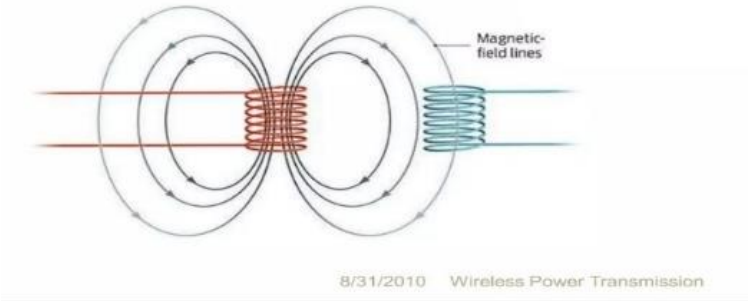

Fig.2- Inductive Coupling

Resonance Inductive Coupling

- Combination of inductive coupling and resonance
- Resonance makes two objects interact very strongly
- Inductance induces current

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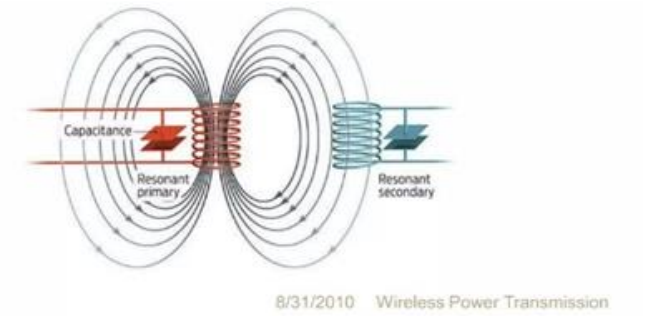

Fig.3- Resonance Inductive Coupling

Microwave wireless power transmission is a technology that uses microwave devices to convert electrical energy into electromagnetic energy and wirelessly transmit microwave electromagnetic energy in space through a transmitting antenna, Microwaves use radiation as the method of heat transfer. Radiation refers to heat transfer via electromagnetic waves, such as microwaves. Conduction is heat transfer via direct contact between two objects.

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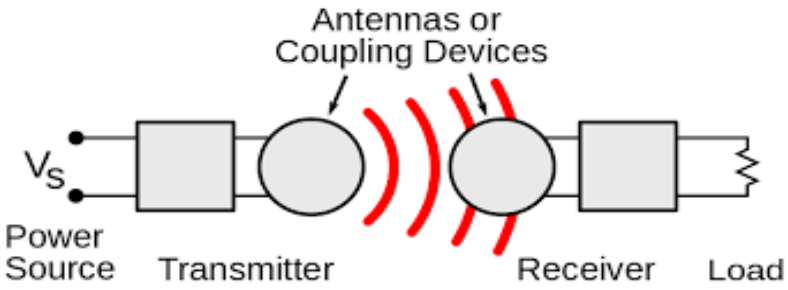

Fig.4- Microwave Power Transmission

➢ **LASER Power transmission**

- Laser power transmission (LPT) is considered a potentially efficient way for power delivery, especially in long-distance wireless applications and harsh hazardous environmental conditions.

The electrical-to-optical conversion efficiency of modern laser technology can be as high as 85%, and off-the-shelf semiconductor diode lasers can have an output efficiency of around 50% Resonators.

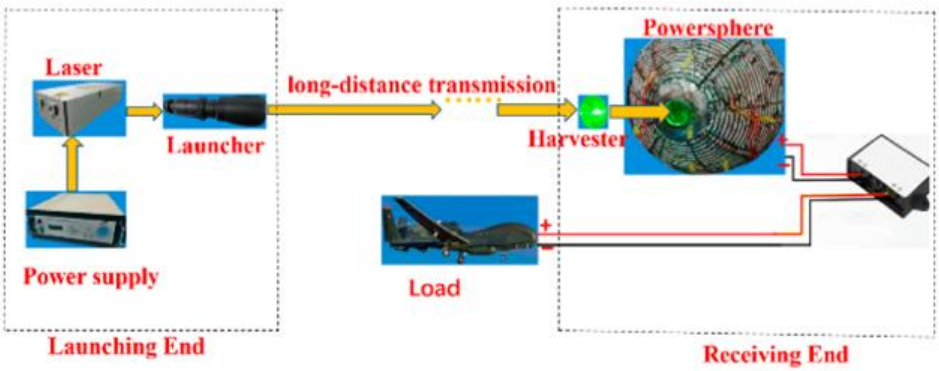

Fig. 5- Microwave Power Transmission

This creates magnetic field in the region around a transmission coil, tune a reception coil to the same resonant frequency as the source, it will couple resonating anywhere within that region, converting oscillating magnetic field into an electrical current within the reception coil this response is called coupled magnetic response. The power can be fed to the load for charging battery.

IV. APPLICATIONS OF WPT

- Wireless power transfer (WPT) can be used either to directly power the device such as LED lights or a TV and to recharge a battery such as a mobile phone by simply placing it on aboard. Communication between medical devices implanted in the human body and external equipment has long been known. An example is given by the diagnostics parameters transmitted by a peacemaker toward the outside. In this application, an inductive coupling between a small turn placed in the device case and a larger one positioned on the patient's chest allows communication.
- Inductive coupling is the most widely used wireless technology; its applications include charging handheld devices like phones and electric toothbrushes, RFID tags, induction cooking, and wirelessly charging or continuous wireless power transfer in implantable medical devices like artificial cardiac pacemakers,
- There is a wide range of areas that leverages on wireless power transfer technologies. Some of the potential applications of wireless power transfer in consumer electronics include wireless mobile chargers and floor lighting.
- In biomedical, wireless power transfer finds applications in the delivery of wireless energy to biomedical sensors and implantable devices. Brain-machine interface and neural recording systems are also areas where wireless power transfer technology can be used in medicals.

V. ADVANTAGES

i. Simple, safe and high transfer efficiency in short distance.
ii. Long transmission distance, no radiation.
iii. Very High transmission efficiency over a long distance.

VI. FUTURE SCOPE OF WPT

- **Wireless Charging**: WPT is expected to become mainstream in powering consumer electronics like smart phones, laptops, tablets, and wearable's without the need for physical connectors or charging cables. Companies are working on making charging pads more efficient, faster, and compatible with various devices.
- **Ubiquitous Charging Stations**: With improvements in the power transfer range, WPT could lead to public charging stations in cafes, offices, airports, and even public transport vehicles, allowing users to charge devices while on the move.
- **Wireless EV Charging**: One of the most promising future applications is wireless charging for electric vehicles. WPT systems could allow cars to charge while parked or even while driving, through dynamic wireless charging (DWC) infrastructure embedded in roads. This would eliminate the need for charging stations and cables, improving convenience and reducing "range anxiety" in EVs.

VII. CONCLUSION

The concept of wireless power transmission is presented. There recent technological applications that make the human life more benign in the present world have been discussed. Three incipient standard of wireless power technology that is already in competition with each other is adscititiously one of the verbalizes of the topic in near future when other more standards are coming anon.

Among these three wirelesses charging standards, which are going to be win in the race that will be defined by their recent great applications. From the comparison table it shows that A4WP standards which has the immensely colossal magnetic field and immensely colossal charging distance must be keep ahead this technology then other standards whereas Qi and PMA withal ameliorating very expeditious. More applications that are in under research with wireless power charging and in the field of robotics will be in our quotidian uses only if wireless power keeps ameliorating.

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