IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 5, May 2021

DOI 10.17148/IJIREEICE.2021.9541

Wireless Power Transmission For Commercial purposes

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Abstract: It allow power to be transferred from one electrical network to another electrical network without need of wires or exposed contacts.There has been rapid expansion of WPT in mobile phone charger, induction cookers,charging electrical vehicles (dynamic charging) also called road powered electric vehicles .It is expected that WPT industry will grow persistentely in coming decades.Commonly wireless power transfer is conducted using Inductive coupling, resonant inductive coupling and wireless power transfer using microwaves. The wireless power transmission would be in high demand for power suplying in near future

Key Words: - Inductor Coils, Electrical Load, electrical vehicle, electrical devices, Inductive Coupling, Wireless Power Transfer,

I. INTRODUCTION

In present electricity generation the transmission and distribution losses are the main concern of the present power technology. The transmission and distribution system causes some losses of 26% to 30 % of the energy generated. The transmission of power without using wires is very efficient way to overcome from transmission and distribution losses. Nikola Tesla is the one who first conceived the idea Wireless Power Transmission and demonstrated the transmission of electrical energy without wires "that depends upon electrical conductivity as early as 1891[2]. In 1893, Tesla demonstrated the illumination of vacuum bulbs without using wires for power transmission at the World Columbian Exposition in Chicago. The Wardenclyffe tower was designed and constructed by Tesla mainly for wireless transmission of electrical power rather than telegraphy. The power can be transmitted using Inductive coupling for short range, Resonant Induction for mid-range and Electromagnetic wave power transfer for high range. WPT is a technology that can transport power to the locations, which are otherwise not possible or impractical to reach. Charging low power devices and eventually mid power devices by means of inductive coupling could be the next big thing. Major issue in power system is the losses which occur in the transmission and distribution of electrical power from the generating station. The power losses mainly occur due to resistance of wires or conductors used in the power system. Hence wireless power system is the best alternative for efficient power transfer as it does not involve conductors and hence no losses occur associated with it.which makes us think About WPT technology can be used for commercial purpose

WIRELESS POWER TECHNOLOGIES AND THEIR COMMERCIAL USES

A. Near Field Technique

[a] **Inductive coupling:**

In inductive coupling (electromagnetic induction) power is transferred between coils of wire by a magnetic field. The transmitter and receiver coils together form a transformer (see diagram). An alternating current (AC) through the transmitter coil creates an oscillating magnetic field (B) by Ampere's law. Power is transferred to coil , where it induces an alternating EMF (voltage) by Faraday's law of induction, which creates an alternating current in the receiver. The induced alternating current may either drive the load directly, or be rectified to direct current (DC) by a rectifier in the receiver, which drives the load Inductive coupling is the oldest and most widely used wireless power technology, and virtually the only one so far which is used in commercial products. It is used in inductive charging stands for cordless appliances used in wet environments such as electric toothbrushes and shavers, to reduce the risk of electric shock. Another application area is "transcutaneous" recharging of biomedical prosthetic devices implanted in the human body, such as cardiac pacemakers and insulin pumps, to avoid having wires passing through the skin. It is also used to charge electric vehicles such as cars and to either charge or power transit vehicles like buses and trains.

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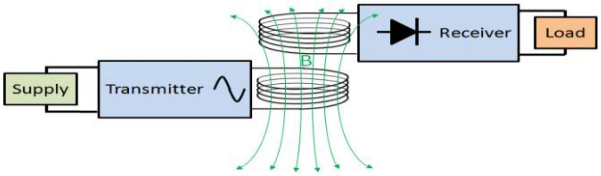
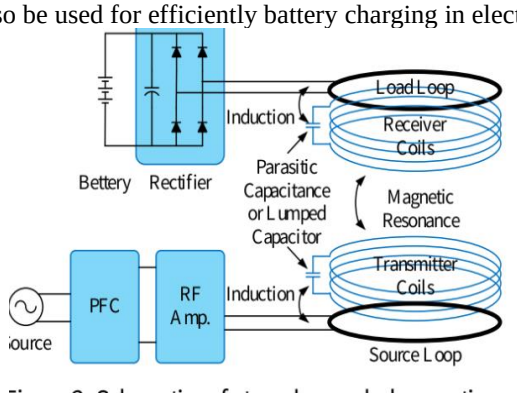


[b]Resonant inductive coupling:

strongly coupled magnetic resonance is a form of inductive coupling in which power is transferred by magnetic fields between two resonant circuits (tuned circuits), one in the transmitter and one in the receiver (see diagram, right).Each resonant circuit consists of a coil of wire connected to a capacitor, or a self-resonant coil or other resonator with internal capacitance. The two are tuned to resonate at the same resonant frequency. The resonance between the coils can greatly increase coupling and power transfer, analogously to the way a vibrating tuning fork can induce sympathetic vibration in a distant fork tuned to the same pitch.

Resonant technology is currently being widely incorporated in modern inductive wireless power systems.[45] One of the possibilities envisioned for this technology is area wireless power coverage. A coil in the wall or ceiling of a room might be able to wirelessly power lights and mobile devices anywhere in the room, with reasonable efficiency.[46] An environmental and economic benefit of wirelessly powering small devices such as clocks, radios, music players and remote controls,this method can also be used for efficiently battery charging in electric vehicles



Schematics of strongly coupled magnetic resonance Wireless EV charging system

B. Far field techniques

a) wireless power transmission using microwaves:

The concept of WPT system can be explained with the functional figure.In the transmission side ,the microwave power source generates power and the output power is controlled by electronic controlled circuits. The waveguide ferrite circulator which protect the microwave source from reflected power which is connected with microwave power source through the coax-waveguide adaptor ,the tuner matches the impedance between the transmitting antenna and the microwave source,the attenuated signals will be then seperated based on the direction of signal propogation,by Directional couplers ,the transmitting antenna radiates the power uniformly through free space to the rectenna.The receiving side the rectenna receives tue transmitted power and converts the microwave power to DC power.

Space solar power satellites (SPS) is the main application of microwave power transmission ,In SPS solar power is captured in space and converted into electricity .The electricity is then converted into microwave and transmitted to the earth .the microwave power will be captured with antenna and converted into electricity.

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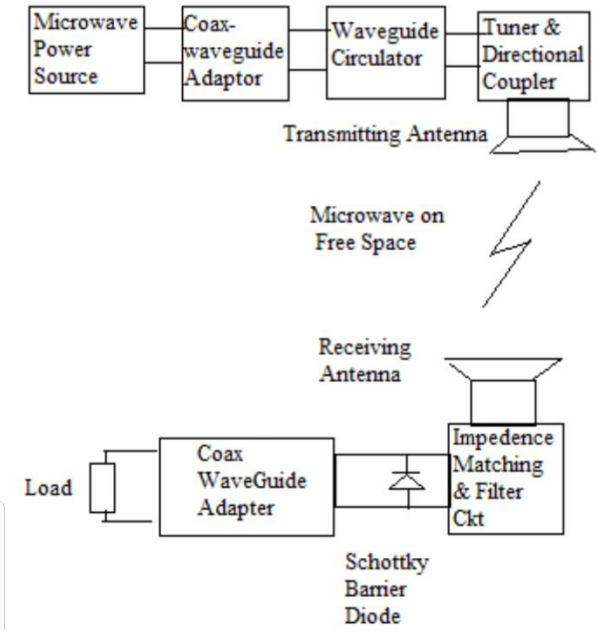

I. ADVANTAGES

1. It will Lower cost for short distances
2. WPT reduce electric shock as it would be galvanically isolated
3. The electrical energy can be economically transmitted without wires to any terrestrial distance, so there will be no transmission and distribution loss.
4. In hilly areas, WPT using microwave can provide us more efficient power transmission with lower cost then conventional power transmission
5. To transmit wireless power to any distance without limit. It makes no difference what the distance is.
6. The power failure due to short circuit and fault on cables would never exist in the transmission.
7. Power theft would be not possible at all.

II. DISADVANTAGES

1. Capital Cost for practical implementation of Wireless Power Transmission to be very high.
2. Interference of microwave with present communication systems.
3. Inefficient for longer distances
4. High power loss during transmission

III.CONCLUSION

Wireless power transfer technology has the potential to change our life in many different ways.WPT not only provide us better energy alternative also it provide us industrial opportunities for manufacturing of various electrical good such as electric vehicles, wireless mobile charging pads, electric toothbrush, Space solar power satellites, and many more.WPT is new generation technology ,lot of research work has done on it but still the concept is in embryonic stage. The day is not so far when there will be no wires and power theft.

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