

WIRELESS POWER TRANSMISSION SYSTEM

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Abstract

This paper is based on the project of design & implementation of Wireless Power Transfer (WPT) System. This system is for transmitting the electrical power from a transmitting source to load wirelessly with the help of the coils. In this project, two coils will be there, the transmitter side coil will be known as primary coil and the receiver side coil will be known as secondary coil. Here, the power from the source is transmitted as a magnetic flux. So, when the AC power is applied to the primary side will be converted to the magnetic flux by the primary coil. Due to this flux an E.M.F. will be induced in the secondary coil. In this way, the WPT will work for power Transmission.

Keywords: Wireless power transfer (WPT), Highly Resonant WPT, Flux, Field technologies, Fundamental problems, Application prospects.

1. INTRODUCTION

The WPT can be defined as, "The energy will be transmitted from the transmitter to a receiver through an oscillating magnetic field." It works by the principal of Electromagnetic Mutual Induction. Here the power is transferred from one medium to other medium though there is no any physical connection between the coils.

While the transmission and the distribution of electrical power losses will be there which a big issue is. These losses are approximately up to 26%. Due to the wire resistance which is used in grid the power loss during transmission and distribution occurs.

Nikola Tesla has proposed method of transmission of electricity using electromagnetic induction. The Technology of the Wireless Transmission is a trend of development in electronics with electrical with electrical applications. As day by day there is increase in demand, the generation of power increases and also the power loss. Wireless Power transfer is the transmission of electrical energy from the primary to secondary without any connections of the conductors. Wireless transmission is useful in case where connections of wires are not possible, not convenient or difficult.

2. OBJECTIVES

There are several benefits of using this system such as –

- To develop a device for the transferring of power wirelessly
- To design and implementation of a WPT system for residential point of view.
- Elimination of the wired connections that may cause accidents.
- To Eliminate the wire installation
- To take an initiative for the consumer wireless power

3. WIRELESS POWER TRANSFER

Wireless power transmission, also known as inductive power transfer, may be applicable for short range or even long range without connections.

WPT provides efficient, fast, and low maintenance & economical as compared to other technologies.

It also allows portable chargers to charge themselves without ever being plugged in ubiquitous power wire.

The "Father of Wireless" Nikola Tesla, was the first person to conceive the idea of wireless power transmission and successfully demonstrated the transmission of electricity without wires in 1891. And he is also credited for his remarkable AC generation.

He won to illuminate the World Columbian Exposition in 1893 in Chicago, where he demonstrated the theory of illuminating the vacuum tubes bulbs without using wires.

There are two techniques in wireless power transfer, such as near-field technique and far-field technique.

In general, near-field technique with higher frequency transmission and far-field techniques provide lower frequency transmission with simple pattern measurements and complete pattern measurements.

3 (A). Near-field Techniques

The near-field techniques measured with appliance near from the power source. It can be sub divided into three categories, such as electromagnetic radiation, magnetic resonant coupling, and inductive coupling, which may be used to eliminate problem due to weather and security concerns?

3 (B). Far-field Techniques

The electrical load far from the power source can be measured with the far-field techniques. These techniques aims at high power transfer and need line of sight.

It can be separated into two sub sections, like microwave-power transmission and laser-power transmission.

4. METHODOLOGY

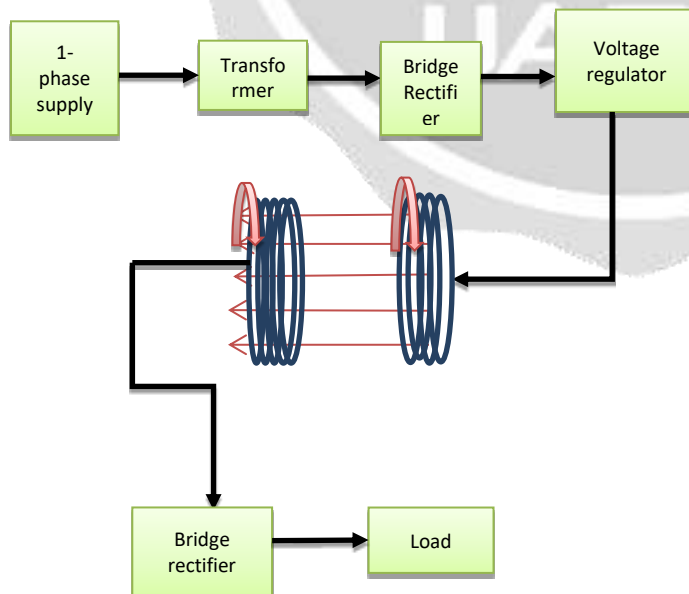


Fig. 4. Block Diagram

4.1 Transformer

A **Transformer** is a static device, having no rotating parts, which transfers an electrical power from primary side to secondary side without changing frequency.

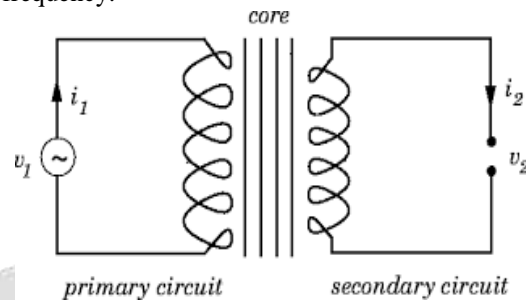


Fig.4.1 Transformer

With respect to function the transformers can be classified as: Step up Transformer and Step down Transformer. A Step up Transformer converts the low primary voltage to a high secondary voltage i.e. it steps up the input voltage. And the Step down Transformer on the other hand, steps down the input voltage i.e. the primary voltage is more as compared to the secondary voltage.

4.2 Bridge Rectifier

Rectifiers converts an alternating current to the direct current. The most efficient rectifier circuit in the rectifiers, is the bridge rectifier. **Bridge Rectifiers** convert alternating current (AC) into direct current (DC) using diodes arranged in the bridge circuit configuration. it is made of four or more diodes. The same polarity wave will be generated as the output wave irrespective of the polarity at the input.

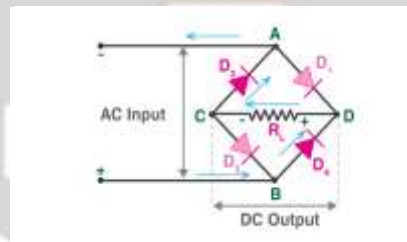


Fig. 4.2 Rectifier circuit

When the bridge rectifier is supplied by an AC signal, terminal A becomes positive while terminal B becomes negative during the positive half cycle. Hence diodes D_1 and D_3 becomes forward biased whereas D_2 and D_4 become reverse biased.

4.3 Voltage Regulator

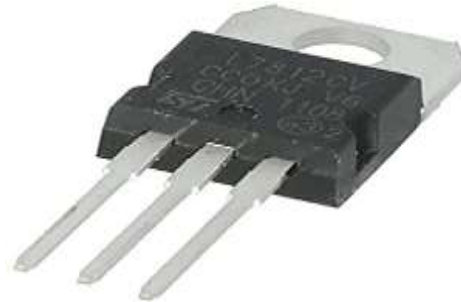


Fig. 4.3 Voltage Regulator

Voltage regulator is a circuit which keeps and develops a constant output voltage, irrespective to the changes to the input voltage or load conditions [2].

Voltage regulators (VRs) maintains the supply voltage within a range that is compatible with the other electrical or electronic components. Even if VRs are generally used for DC/DC power conversion, it can be used for AC/AC or AC/DC power conversion too [4].

It maintains the voltage in a circuit nearly equal to the desired value. These are one of the most common electronic components, whereas the components in the circuit can be damaged due to the raw current which is frequently produced by the power supply [7].

4.4 Transmitter & Receiver

The wireless power transmission based on the inductive energy which is to be transmitted through an oscillating magnetic field from the transmitter coil to the receiver coil. By particularly designed electronics built into the transmitter the supplied DC current is modified into high-frequency AC current



A magnetic field is created due to the AC current increased in a copper wire, in the transmitter section (XMTR or TX). Once an RX (Receiver) coil is found just about the magnetic field, then the magnetic flux can induce an AC current within the receiving coil. The AC current converted into DC current by the electrons within the receiving device, which makes the working power. These are the most familiar of the MR coils. They are doing one or both of the subsequent two things: (1) send or "broadcast" the RF pulse; and (2) receive or "pick up" the MR signal. In their simplest form, they are circular segments of wire with the ends of the wire attached to whatever is processing the signal or generating the heart-beat/pulse.

5. WORKING PRINCIPLE

This paper is based on the concept of design & implementation of Wireless Power Transfer (WPT) System Elimination of the wired connections that may cause accidents. This paper is based on creating a circuit which converts AC 230V 50Hz to AC 12V, High frequency (HF). The output is fed to a tuned coil shaping as main of an air core transformer. The 12volt with high frequency is developed by the minor coil.

As soon because the supply given to the machine, it goes to the core type transformer, a static device which might convert the voltage from one voltage level to a different voltage level without changing the frequency. It wants to step down the transformer. Because the transformer worked then the Bridge rectifier, an electronic

device which convert one energy source to different energy source and regulates the voltage from one point to other point. Then the transmitter coil transmits the energy by Electro-magnetic induction law & the receiver receives the energy & they generate a magnetic flux without intersecting one another and then the loads such as mobiles, TVs works.

6 ADVANTAGES

Compared to the standard technology, Wireless power transmission has obvious advantages, but its development continuous to be restricted by many factors, which needs the research. This system may have the *Advantages* as-

- It may be more effective, practical when the transmitting and receiving points are along a line of sight
- It may have Lower frequency operation
- It should be Efficient
- It will be harmless for human beings.

7 APPLICATIONS

This technique may be applicable for-

- Transport- Avoid the accidents, Transportation charges are less.
- Consumer Electronics- Products like wireless charging pad and wireless charging table have begun to require place in market.
- Industrial engineering – For production purpose.
- Medicals- There are studies about the charging of medical products such as pacemaker while inside the body.
- LED-With using wireless power transmission in LED (Light Emitting Diode) lights, we will directly charge our devices using wireless electricity so it can eliminate the requirements for batteries in under-cabinet task lighting.

CONCLUSION

The model architecture is meant to handle the challenges faced by customers in such some way. The concept of wireless power transmission may be a leading innovation in the world. This could change the era of wasting lot of copper for using it for home wiring. The WPT saves the saves the energy consumption and transmission losses as compared to the conventional wired transferring wireless transfer. With the help of wireless power technic more applications that are in under research like wireless power charging and within the field of robotics are in our daily uses.

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