



## Wireless Power Transmission

<sup>1</sup>Chetan Matkar, <sup>2</sup>Yashashree Shrivastav, <sup>3</sup>Dishant Chavhan, <sup>4</sup>Ganesh Nale, <sup>5</sup>Prof. Ekeshwari A. Rangari

<sup>1,2,3,4</sup>, Students, Department of Electrical Engineering, Jagadambha College of Engineering and Technology, Yavatmal, Maharashtra, India

<sup>5</sup>Assistant Professor. Department of Electrical Engineering, Jagadambha College of Engineering and Technology, Yavatmal, Maharashtra, India

<sup>1</sup>chetanmatkar456@gmail.com,

<sup>2</sup>yashashreeshrivastav@gmail.com,

<sup>3</sup>chavhandishant90@gmail.com, <sup>4</sup>naleg558@gmail.com, <sup>5</sup>ekeshwari.rangari@gmail.com

### Article History

Received on: 09 April 2022

Revised on: 10 April 2022

Accepted on: 27 May 2022

**Keywords:** Wireless power transfer (WPT), inductive coupling, Qi standard.

e-ISSN: 2455-6491

**Production and hosted  
by**

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### ABSTRACT

In this paper, we present the concept of transmitting power without using any wires also discussed its application, its long-term effect on society, advantages, disadvantages. Wireless power transmission (WPT) has been attracting a wide range of subjects in various fields and also become a highly active research area because of their potential in providing high technology to our daily lives. The wireless power transmission will be mandatory to use in the near future because this technology provides the transmission of electrical energy from a power source to an electrical load across an air gap without interconnecting wires.

### 1. INTRODUCTION

Electrical energy will be transport by the cord for the distribution of the energy to every places. The major issue in this type of power transmission is the losses occurs when transmission and distribution process of electrical power due to the energy dissipation in the cord. The conductor and other energy distributing equipment used for transmission in energy dissipation. In our daily life the power generation and the need for more energy is also increased. The cost of energy is also increasing as the demand is very high. So, reducing the

losses is very necessary to save the energy. Stored power loss during the transmission process is unavoidable some methods can be interpreted to solved. To minimize power losses in the power distribution network with using of wireless power transmission. That has been known for centuries to clean sources of electricity,

1. Battery charging with wireless power transfer is the best example of this. The concept of wireless power transfer is not a new idea for anyone. But more inventions and technologies are happening in this regard. WPT is very new and encouraging revolution in

the mode of electricity transmission. That new revolution gives the reliable and efficient wireless charging of millions of everyday electronic devices with integrating a power source to an electrical load without any wires. In the early time many different scientist proved different uses and thinks to transfer power without connection between the source and appliance. Every new technologies discovering in WPT needs more invention and has very big future scope.

## 2. LITERATURE REVIEW

The idea of transmitting power wirelessly is not new. In fact it is widely popular since 19th century, when this technique was implemented conduction based wireless power transmission system instead of using a resonance based magnetic field to transmit electrical power without wires. As the method was radiative, large amount of electrical power was getting wasted [2].

Three electric bulbs were lit by a power source kept 60 feet (18metres) away from the bulbs, and the complete demonstration was properly documented. Tesla had planned to transmit power without using wires i.e. wirelessly across the Atlantic Ocean with his Long Island based Warden clyffe Tower. This never happened due to several problems, including timing and funding [6].

Wireless power transmission technique makes use of time-varying magnetic, electric, or electro-magnetic fields. This technique can be used to power electrical and electronic devices where wires cannot be used or at the places where wired interconnection is impossible or inefficient. In 1826, Andre-Marie Ampere developed ampere's circuital law that shows that the electric current flowing through a conductor will produces a magnetic field [1, 4].

## 3. SYSTEM OVERVIEW

Inductive power transfer also a name of wireless power transfer. It can be used for short range or even long range without cords. This WPT technology provides efficient, fast, and low maintenance cost as compared to other technologies. It also allows portable electronics to charge themselves without ever being plugged in universal power wire. Power loss of this WPT technology is very less as compared to wired electricity transmission. The common function of WPT is to allow portable devices to be continuously charged and lose the constraint of a power cord. There are three main systems in WPT: Microwaves, Resonance, solar cells

Nikola Tesla was to begin with which conduct tests is managing with WPT. His thought was that soil itself may be a conductor that can carry a charge all through the

whole surface. When Tesla's tests were not making power, that time they fair exchanging it. These thoughts can be applied to fathom our energy crisis. Little and versatile innovation may be a portion of standard of living. But from compactness emerges another challenge is vitality field. Now days all convenient gadgets are battery fueled, they all must be revived utilizing the wired chargers. But utilizing of WPT presently rather than stopping in a cell phone, PDA, advanced camera, voice recorder, mp3 player or portable workstation to revive it, it might get its control wirelessly. In spite of the fact that remote control exchange is attainable and makes a difference in human everyday lives, but this innovation endures from a few downsides specifically requires a arrange of hundreds of satellites and interferer with other electronic gadgets.

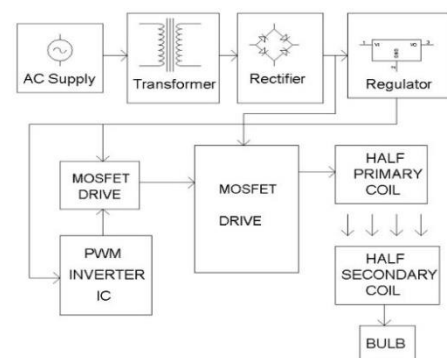


Figure1: Block Diagram

The fig 1 shows the block diagram of how the power is transfer without using any chord or wire. The supply from the AC source is given to primary of transformer which gives the desired power needed. Then the output is rectified by rectifier which rectifies the input and then through MOSFET power is transferred. The power from primary is directly transfer to the secondary winding without using any means of connecting devices.

There are two techniques in wireless power transfer:  
A. near-field technique B. far-field

### A. Near-field Techniques

The near-field techniques are quantifying with appliance near from the potency source. It have three categories: These techniques can be habituated to eliminate quandary due to weather and security concerns Maintaining the Integrity of the Specification.

**Electromagnetic (EM) Radiation:** Energy from the transmission receiving wire of energy source to the collector radio wire through radioactive EM waves is the method of outflow by EM radiation. Multidirectional radiation and unidirectional radiation, this two segment consigned within the sense of the course of transmitting

energy. Through radiation prepare, broadcasting EM waves through transmitter in an relegated ISM band for case 850–950 MHz or 902–928 MHz within the U.S. which can be changes with the distinctive locale both with 915 MHz center recurrence, and a collector for illustration RFID labels tunes to the same recurrence band to collect radio puissance. In omnidirectional radiation in spite of the fact that data exchange is more simple and congruous but withal endures from a serious effectiveness quandary in vitality exchange since when the separate is going sizably voluminous there's quick rot of EM waves.

**Inductive Coupling:** Inductive coupling is defined as coupling between to LC circuits where resonant frequency is equal and same. It works by utilizing magnetic field induction that is the natural part of current's kineticism through chord ore wire, as an example alternating current in a primary coil that is connected to a source can engender a varying magnetic field that induces a voltage across the terminals of a secondary coil at the receiver. secondary and primary coils are two separate coils in inductive coupling. Every connected wirelessly and the reason of its accommodation, safety and inductive coupling has been a paramount and popular technology to transfer power without wires. With this technological application sundry kinds of electronic devices have been already made. Consequently, it has been prosperously commercialized to a number of products, including electric toothbrush, charging pad for cell phone or laptop, and medical implants. In inductive coupling, power transfer gradually decreases when the two coils are being separate gradually from each other or when the alignment of two coils is not impeccable. These kinds of quandaries are generally occurred when it's not meticulously utilized. It works best when the charging node of the contrivance and power receiving node are proximate in contact customarily less than a coil diameter, for example the range can be in centimetre and the direction of the charging must have to be aligned.

**Magnetic Resonant Coupling:** The last and most paramount category of WPT technology under the section of near field techniques is magnetic resonant coupling. This technology was developed by Kurs et al., which enable to make the interactions between two different objects very vigorously because of the coalescence of inductive coupling and resonance. In additional energy will be shifting back and forth between magnetic field circumventing the coil and electric field around the capacitor. To the classical mechanical

resonance the effect of magnetic resonance is analogous, under which a string when tuned to a certain tone it can be exhilarated to vibration by a faraway sound engenderer if there is a match between their resonance frequencies. In this technology, energy can be transferred efficiently from a source coil to a receiver coil with little loss of energy to alternating current in a primary coil (connected to a source) engenders a varying magnetic field that induces a voltage across the terminals of a secondary coil at the receiver. There are several advantages of this technology namely highly efficient, radiation loss will be negligible, provides much more preponderant range and directional as compared to inductive coupling.

#### *B. Far-field Techniques*

The far-field techniques are quantifying the electrical load far from the puissance source. These techniques aim at high power transfer and need line of visual perception. It can be disunited into two categories, which are microwave power transmission and laser power transmission. 1) Microwave Power Transmission (MPT): This technology transfers high power from the base station to the receiving station or mobile contrivances with two places being in line of optical discernment. With the avail of geosynchronous receiving and transmitting satellites, this technology enables the objects to acquire power from the base station with utilizing the magnetron. The first step of potency transmission is initiated with converting electrical energy to be microwaves energy and then microwaves energy will be captured with utilizing rectenna. Consequently, AC needs to be converted to Direct Current (DC) first and then DC is converted to microwaves by utilizing magnetron. Transmitted waves are received rectenna and then rectify microwaves into electricity with more efficiently. It will give DC as the output.

### **4. RECENT TECHNOLOGIES**

Utilization of resonance has rapidly grown in recent years to enhance the efficiency of wireless energy transfer in a wide variety of applications. In additament, the indispensable core components of electronic product are being developed by electronic companies to avail speed the exordium of the technology into niche applications. This will boost our ingenious capacities to bring much more substantial transmutations in technology so that can be implemented in particular tasks. Some of these revolutionary applications have been launched into market, while others are not yare yet for the commercial market. For instance, automotive

charging is a novel innovation but not available into market because of needing standardization in its charging infrastructure. On the contrary, a breakthrough innovation for traditional inductive charging in mobile electronic has already developed by a consortium company. To ascertain that multi-vendor products can charge anywhere in a mundane wireless ecosystem, the Standards Development Organizations (SDOs) is working to construct the interoperability standards in mobile contrivances for highly resonant wireless power transfer. All these efforts are paving the way toward incipient trend of wireless power technology, in which can be deployed in many applications.

#### A. Qi Technology

This technology utilizes the minuscule inductors to transfer power over higher frequencies and additionally support a charging distance of a few centimetres at most. As a result, portable contrivances have to be placed quite categorically on the dock for evading the shortage of an astronomically immense magnetic field. Owing to its circumscription on charging area, Qi components can utilize multiple resonator arrays to engender a more astronomically immense charging area. However, it still does not mitigate the quandary and even wasting an abundance of puissance to have individual coils switched on. In order to keep a vigorous enough connection, users consequently need to align their contrivances precisely with the magnetic fields. Currently, the wireless charger can get warm during charging and it will heat up the back of a contrivance due to the operating frequency heating conductive materials. The Qi standard withal incorporates an inhibited communication protocol to circumscribe the potency consumed by multiple coils.

#### B. Coalition for Wireless Power (A4WP) Technology

A 4WP is a next-generation of wireless power transfer enabling the efficient transfer of puissance to electronic contrivances. This is predicated on reference power transmitting and receiving resonators without the utilization of interconnecting wires. This technology sanctions multiple contrivances to be charged with differing power requisites from a single transmitter at any one time. Because this technology utilizes a more sizably voluminous electromagnetic field rather than the minute inductor coils, ergo it enables contrivances to be charged without having to line-up precisely with the coil. Albeit A4WP has not relinquished to the market yet the subsistence of this technology enables the electronic contrivances to be charged in any positions including Z-axis. A further advantage of A4WP is sanctioning charger to be embedded in the objects where the magnetic fields can still emit the energy from the objects.

#### C. PMA Technology

This is the organization with the aim of forward cerebrating in an ecumenical, not-for-profit, industry where better power paradigm for battery equipped contrivances utilizing wireless charging technology has been working with a bunch of research group bellwethers. Recently more than 100 members across a diverse set of industries including telecommunication, consumer contrivances, automotive, retail, furniture, surfaces and more are working with this incipient standard of technology. PMA magnification and prosperity is attributed to a unique approach of making wireless charging ubiquitous in the places that consumers need it most as well as the strenuous exertion and dedication

### 5. RESULT

Thus, the power transfer can be done with the transmitter (primary) to the receiver (secondary) that is separated by a considerable distance (say 3cm) which is shown in fig 2. Therefore, the power transfer could be seen as the TX transmits and the RX receives the power to run a load. Moreover, the WPT technique can be used to charge gadgets like mobile phones, laptop batteries, iPods, propeller clock, etc. And also this sort of charging offers a far lower risk of electrical shock. Furthermore, this project can be enhanced by increasing the distance of power transfer as the research across the world is still going on.



Figure 2: GSM Wireless Power Transfer Module

Thus, this is all about wireless power transmission, wireless power transfer circuit working and its applications which include simple electronic devices like mobile phones, mobile chargers, etc.. Wireless power transfer not only reduces the risk of shock and stops to plug frequently into the sockets.

### CONCLUSION

The concept of wireless power transmission (WPT) is presented. There recent technological applications that make the human life more being in the present world have been discussed. WPT is an developing and challenging and interesting field attracting contributions from several areas including nanotechnology and material science, applied electromagnetics, power electronics and RF and microwave electronics. Additionally, it spans over a wide range of frequencies from kilohertz to millimeter waves, as well as a wide range of power levels from microwatts to kilowatts, posing a variety of challenges to the designer, some of which have been highlighted in this paper. Three incipient standard of wireless power technology that one of the verbalizes of the topic in near future when other more standards are coming.

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