

WIRELESS ELECTRICITY – ‘THE WITRICITY’

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Abstract - The Wireless Power transmission is the long-term crises for the emerging Technology. It has been attracting a wide range of subjects in various fields and also become a highly active research area. The wireless power transmission will be mandatory to use in the near future because this technology enables the transmission of Electrical energy from a power source to an electrical load across an air gap without any interconnection of stringing wires. A “Wireless Power Transfer” is a collective term that refers to a number of different technologies transmitting energy by means of Electromagnetic fields. When the supply frequency matches the resonant frequency wireless power transfer can be achieved. In our Project “Electromagnetic Induction” is the main principle for Wireless Power Transfer. The Magnetically coupled and electrically isolated system consists of a “Transmitter” connected to a source of power such as main power line will convert the power to a time varying Electromagnetic field to the “Receiver” device which is given to the electrical load. In order to achieve better efficiency for the long transmission of Wireless power, additional Magnetic field is created by placing Ring magnet. This project exposes a new method for wireless power transmission using electromagnetic waves that comprises a transmitter and receiver in which WIRELESS ELECTRICITY can be generated.

Key Words: Wireless Power Transmission, Wireless Electricity, Nikola Tesla, Transmitter, Receiver, Electromagnetic Induction, Magnetic Field, Ring Magnet.

1. INTRODUCTION

Nowadays, Wireless Power Transmission is a new and latest technology to transfer Electricity without the use of wires. The technology of the Wireless Power Transmission can eliminate the use of the wires and batteries; thus, it increases the mobility of the electronic devices, more convenient and safer for all users. The wireless power transmission technology is widely used in the electronic devices such as laptops, mobile phones, and many more. In addition to the electronic devices, the Wireless Power Transmission also is useful and important for the industrial and medical applications. The concept of wireless electricity was realized by Nikola Tesla in 1899. Wireless power transmission is not a new idea. Nikola Tesla demonstrated transmission of electrical energy without wires in early 19th century. Tesla used electromagnetic induction systems. Researchers developed several techniques for moving electricity over long distance without wires. The human life in order to

provide convenience and flexibility of a medium power field studies must be carry out.

1.1 Objective

- ❖ To create a ‘WIRELESS POWER’ for the World
- ❖ To demonstrate that Power is successfully transferred Wirelessly
- ❖ To reduce capital investment for wires and cables
- ❖ To achieve WPT via Inductive Coupling and Magnetic Looping
- ❖ Trying to make Radiation free Technology while Power Transmission
- ❖ To reduce Power losses occurs by wired Transmission

1.2. Literary Review

In our Project we aim to study and implement the Wireless Electricity to a certain area. After a long and deep research and innovation we came to the solution to make it possible. As a key to the project in Future, there are so many proposals and demonstration regarding WPT has put forward. Experimental results for a WPT system were shown to verify the feasibility of our Proposed Idea of Wireless Power.

- Nikola Tesla’s Demonstration of Wireless power Transmission at Colorado Spring, Wardenclyffe Tower – Article – 1899
- NASA JPL Goldstone Demonstration for Wireless Power Transmission – 1975
- JAXA (Japan Aerospace Exploration Agency) – SSPS concept proposed by Dr. Peter Glaser of the United States in 1968 Glaser, P. E., “Power from the Sun; It’s Future,” Science, 162, pp.857-886, 1968.
- Wireless Electricity (Witricity) - Journal of Electrical Engineering & Technology (JEET) Volume 2, Issue 1, Jan-Dec, 2016, pp.01-07, Article ID: JEET_02_01_001
- MIT – Massachusetts Institute of Technology – WiTricity - 2007.
- Dawn of Wireless Electricity (Commercial) – New Zealand PowerCo – 2021

1.3. Principle and Working of WPT

Wireless power transfer works on the inductive power transfer principle, as found in the conventional transformers. Here, we have used to Electromagnetic Induction with Additional Magnetic Field. As the circuit was magnetically coupled and electrically isolated, both the transmitter and the Receiver are kept at a certain distance for WPT and the distance of wireless power is increased by placing Magnets.

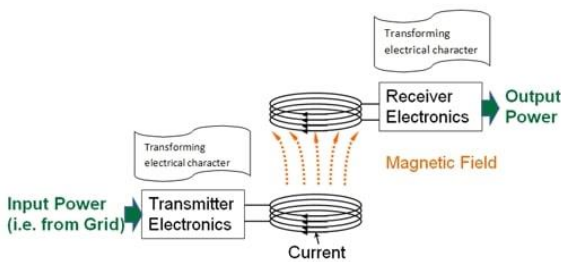


Fig - 1: Principle and Working of WPT

The introduction of resonators with the same frequency in the sources and receiver coil respectively ensures that the two systems couple magnetically, thus allowing for higher energy transfer efficiency. This means that the power transfer happens over an air gap without the need for metal or other material.

1.4. Types of WPT

Wireless power techniques mainly fall into two categories, near field and far-field. In near field or non-radiative techniques, power is transferred over short distances by magnetic fields using inductive coupling between coils of wire, or by electric fields using capacitive coupling between metal electrodes. Inductive coupling is the most widely used wireless technology.

- Electromagnetic Induction
 1. Electromagnetic Induction
 2. Electrostatic Induction
- Electromagnetic Radiation
 1. Microwave Power
 2. Laser Power

1.5. Block Diagram and Circuit Diagram

The block diagram shows the source used by fly back transformer. The next one is the filter, here the low pass filters are used because of its smaller harmonics of resonant. The control system controls the system. Then the most important part is the transmitter and the receiver which will produce a unwired power system.

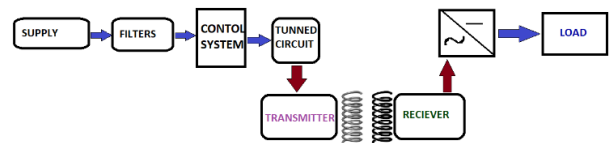


Fig - 2: Block Diagram

A new method of improving the efficiency by using the primary and secondary winding with ring magnet. By placing Magnetic field with a required range, the whole setup will generate the high efficiency of supply for long distance. The magnetic coupling will help to improve and withstand required load capacity. The size of the magnet was small which is kept for 50 cm or 1m gap from the secondary coil. The wireless emission from the secondary coil to the atmosphere is increased by placing the magnet in between the coil and the destination.

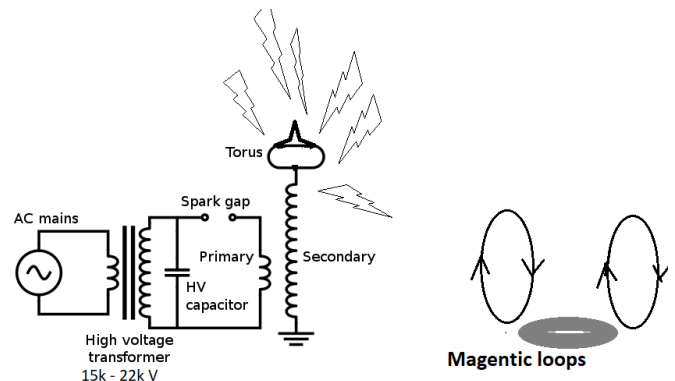


Fig - 3: Circuit of WPT with Magnet

2. SIMULATION

Before coming to commercial the system must be simulated online for the future prediction of the efficiency, range, application, etc. In this system, the entire WPT configuration is calculated in the online calculator called JAVATC. This is one of the best online Calculator for the Tesla coil and the wireless power parameters. Through this online Calculator the frequency, RF range, Electricity, etc. can be predetermined. JAVATC comes with the option to load a sample coil as well, allowing you to see how the program works. You could also just enter the secondary details and run it to get partial results, the same with the primary etc. By including your power details (entered further down the page) the program will let you know if your capacitor value is going to be resonant with the mains frequency. After this the primary, secondary and toroid details of the WPT is filled. After entering all the values of the system, the JAVATC is allowed to run. Thus, the system is calculating and gives the respective output of the constructed design.

In Simulation, we Calculated the rating of WPT. Through this Online Calculator, it is found that the Resonant

Frequency created is up to the 168 Hz Frequency. The total energy transfer is 10258.55 μ s, the Mutual Inductance of the coil is of 207.55 μ H. The Voltage produced is 112 V and the Current will be of 10mA. The VI characteristics of our constructed system is also given through this online calculator.

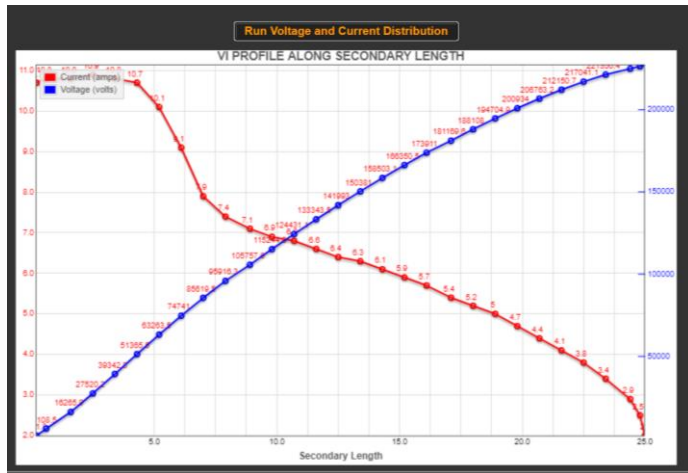


Chart - 1: VI Characteristics in JAVATC

2.1. Components of WPT

To make possible our idea we combined the components. Some of the components that we used in our project are listed below,

- Power source
- Flyback transformer
- Resister
- Capacitor
- Neon bulb
- PVC pipe
- Gauge wire (Copper)

POWER SOURCE – A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. Our power source is build using the Fly back transformer.

FLY BACK TRANSFORMER – A fly back transformer also called a line output transformer it is a special type of electrical transformer. It was initially designed to generate high voltage saw tooth signals at a relatively highfrequency.

Using this transformer, we produced up to 15kV as a input for our coil.

RESISTOR – This is used to oppose the high current in the circuit. Here we have used the two range of resistors such as 22 Ω and 220 Ω .

CAPACITOR – It is used for charging and discharging. Here we have used MMC (Multi Mini Capacitor) model of capacitor. It is used as both filter and as a booster.

NEON BULB – Here, we used the Neon bulb as a source to show the Wireless Power. Due to its simpler construction and economical, we used this type of lamp.

PVC PIPE – To wind coils we used the PVC pipe for both primary and secondary. The secondary pipe was at the height of 30cm and primary is of 15cm. Here, we used Copper wire as a winding material and wounded up to 700turns for secondary.

2.2. Assembling of WPT

In Hardware implementation, we got the successful output. It can able to produce the Wireless Electricity around 3 meters distance with Magnetic principle. It also produces around 9W and Voltage of about 220V with the mA current. Here we used the Neon Bulb for the indication of WPT. So, after implementation the bulb glows at a distance of around 3 meters distance in it.



Fig - 4: Model of our Witricity

3. CONCLUSION

Thus, we conclude our Project. We analyzed the research documents and articles based on our Research Project named 'Wireless Electricity' or Wireless Power Transmission (WPT). With reference to our research documents, we prepared our own concept. Following this we build our Block Diagrams, Circuit, Components designing, Hardware construction etc. In our Project both online Simulation and the Hardware is implemented. Here, The Electricity is successfully transmitted wirelessly. So, we got the very good output as we expected. In case of online Simulation, the Output is verified using the online Calculator the Current, RF frequency, etc. are verified. In case of hardware the WPT is tested and implemented practically.

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