International Journal on Emerging Technologies (Special Issue NCETST-2017) **8**(1): 322-323(2017)
(Published by Research Trend, Website: www.researchtrend.net*)*

ISSN No. (Print) : 0975-8364
ISSN No. (Online) : 2249-3255

Wireless Power Transmission

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ABSTRACT: The aim of this paper is to give an overview on the research and development in the field of wireless power transmission. The evolution in this field from induction to the radio and microwaves. This paper also focuses on the loss occur during wireless power transmission and distribution, how to minimise the loss and make the efficient use of power through microwave transmitters like klystron, magnetron etc. the advantages and disadvantages of wireless power transmission including cost effective.

I. INTRODUCTION

Wireless power transmission is basically the transfer of electrical power from one point to another without any electrical or physical connection. Many challenges occurs during power transmission and distribution. One of the major problem is the loss occurs during power transmission. This loss during power transmission and distribution can be minimized using underground cables but that too remain inefficient in some extreme temperature conditions and unapproachable that is in hilly areas. Although these problem remain, new deals arises with the increase in use of mobile devices. Engineers have required to develop new approaches to supply power to the equipment. Researches have always been kept on going in this field and development in wireless power transmission have been observed.

II. EVOLUTION IN WIRELESS POWER TRANSMISSION

A. Induction

The principle of mutual induction involves electromagnetic coupling and allows transmission of electrical power without any connection between two coils.

B. Electromagnetic waves

Electromagnetic waves have their existence all around us, which can be used to transfer power without the help of wires. Such electromagnetic waves are targeted on the object, this process is known as beaming. For example: solar cell.

C. Radio and microwave

Power transmission via radio wave are more effective way. The power transmission with smaller wavelength typically in case of microwave can be made more efficient. The power transmission through microwave is known as Microwave Power Transmission (MPT).

II. LITERATURE SURVEY

-In1864, James C. Maxwell predicted the existence of radio waves.

-In 1888, bolstered by Maxwell's theory, Heinrich Hertz first succeeded in showing experimental evidence of radio waves by his spark-gap radio transmitter. The prediction and Evidence of the radio wave in the end of 19th century was start of the wireless power transmission.

-Nikola Tesla has been the pioneer in the field of wireless transmission of electrical power. He started efforts on wireless power transmission in 1891. Nikola Tesla successfully lighted a small incandescent lamp by means of resonant circuit grounded at one end.

-William C. Brown contributed much to the modern development of microwave power transmission which dominates research and development of wireless transmission today. In 1960s Brown invented the rectenna which directly converts microwave into dc current.

III. ADVANCEMENT IN THE FIELD OF WIRELESS POWER TRANSMISSION

Many researches have been going on in the field of microwave power transmission. These research and development involves antenna, microwave components (klystron, magnetron etc).

A. Microwave transmitter

The most current research and proposals use microwave as the frequency range of choice for transmission. Higher frequencies are also impractical because of the high cost of transmitters. The most common transmitters for microwave are the Travelling Wave Tube (TWT), klystron and magnetron. Mostly magnetron are used as they are cheaper and more efficient.

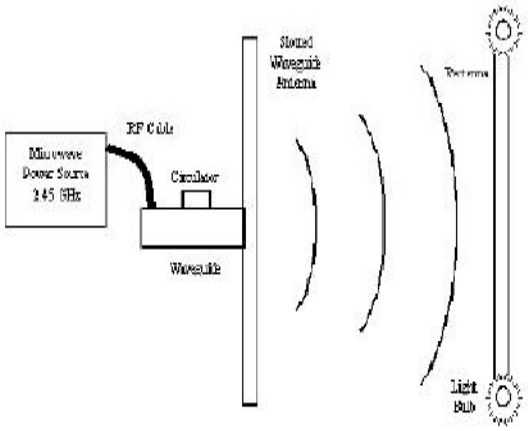

Fig. 1. Microwave transmitter.

A. Solar Power Satellites (SPS)

The solar power satellites launched into the space are used to transmit power to earth stations. A large rectenna array would be built on earth to receive incoming microwave frequencies.

B. WriTricity

The new technology called WriTricity is based on coupled resonant objects. Two resonant objects of the same resonant frequency tend to exchange energy efficiently.

IV. FUTURE ASPECTS

In future many advancement can be seen in the field of microwave power transmission. The loss occurs in the power transmission and distribution is the major factor which is the matter of concern. Solar power satellites had led the revolution in wireless power transmission.

A. Solar Power Generating Satellites

Japan wants to use power from the space. They have planned to send a solar-panel equipped satellite into space that could beam strong stream of power to the earth.

B. 3G wireless power

3G wireless power delivery system is developed. Earlier wireless power transmission technology were based split transformers. The essential difference between earlier wireless power generation and the one developed by power by proxi is that the later one has higher efficiency levels.

V. MERITS AND DEMERITS

A. Merits

The system would reduce the cost of electrical energy used by the consumer and rid the landscape of wires, cables, and transmission towers.

The electrical energy can be economically transmitted without wires to any terrestrial distance, so there will be no transmission and distribution loss. The efficiency of the transmission can be increased.

B. Demerits

Calculating the circulating reactive power, it was found that the frequency is very small and such a frequency is very biologically compatible.

VI. APPLICATION OF WPT

-Moving targets such as fuel free airplanes, fuel free electric vehicles, moving robots and fuel free rackets.

-Automatic wireless charging for mobile robots, cordless tools and instrument which eliminates complex mechanisms, and labour intensive manual recharging and battery replacement.

-Another application of WPT are solar power satellites, energy to remote areas, broadcast energy globally.

-WPT are used for Ubiquitous power source, RF power Adaptive Rectifying Circuits (PARC).

VII. CONCLUSION

The concept of wireless power transmission offers greater possibilities for transmitting power with minimum losses. Furthermore, this could reduce our society's dependence on batteries, which are currently heavy and expensive. As wireless technology is getting popular now a days, the demand of battery is also decreasing. For the long range power transmission power can be sent from source to receivers instantaneously without wires, results in reducing the cost. Batteries need to be recharge or changed eventually, hence there is the need for
This kind of work.

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