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Wireless Power-Driven Car

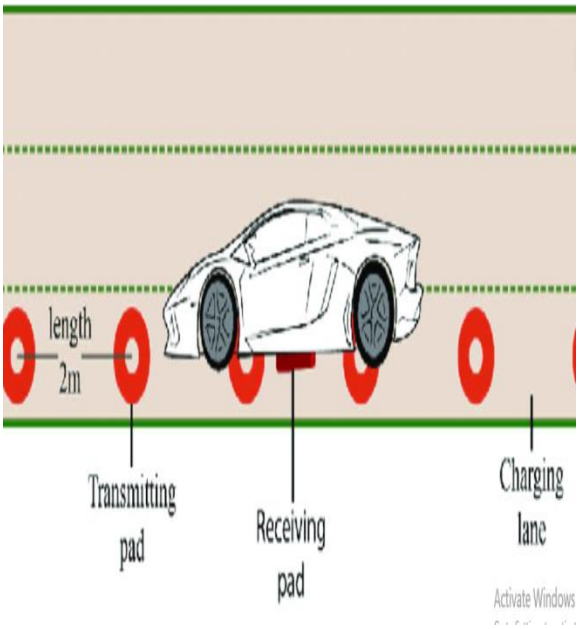
JyotiSrivastava*, Atishay Jain, Aryan Kansal, Udit Mittal
Department of Electrical & Electronics Engineering, KIET Group of Institutions, Ghaziabad,U.P.,India

ABSTRACT
This research paper tells us about wireless power transmission systems for cars. this technology is developing around the world very fast, and this is a need of the future.it is environment friendly also. in this technology, there is no requirement for batteries so power can be transmitted wirelessly. wireless technology makes it efficient. So, this technology uses magnetic coupling to transmit power. It can be used for heavy as well as light loads and is cost-efficient also. In the current scenario, electric vehicles require charging stations to charge them but, in this technology, we do not require charging stations as power will be transmitted through mutual induction. In electric vehicles to transport heavy loads we require big batteries so that enough power can be generated but, in this technology, there is no such requirement as batteries are not needed to power the vehicle instead power is wirelessly transmitted. Wireless dynamic charging is not only for single vehicles, but many vehicles can use this technology efficiently. Its initial cost is high, but the cost of operation afterward is low. At the power level of kilowatts, the transmission distance increases from several millimeters to several hundred millimeters per grid to load efficiency of more than 90%. For electric vehicles market expansion this technology is important so that reliability on batteries can decrease.

Keywords: *Wirelesspowertransmission,mutualinduction,electriccar,EVS*

INTRODUCTION

Today, vehicles are charged at home or, in the case of fleets, at the owner's place of business. Tomorrow, they'll be charged in a variety of additional places, including at work, at the store, on the street and in places of interest. The provision of wireless electric vehicle charging points at these locationsmay increase employee/customer loyalty, attract new customers, and encourage wider adoption of wirelessly charged vehicles in larger population centers, thus reducing air pollution. Ideally, vehicles can be charged whenever and wherever they are parked and EV owners should not have to concernthemselves with the grid connection, which will happen automatically.



The motive of our project is to build such a system that it can be used wirelessly which can be used in transportation. Our proposed system can run in a specified path like a train runs on pantograph.The system is built on 230 volt ac supply 50 Hz to ac 20 KHz in an 18-volt circuit.

Thistechnologyismainlystructuredona two-waysub-system.Oneisthe Roadwaysubsystem,andanotherisOn-Boardsubsystem.

RoadwaySubsystem

The power supply required is being provided by roadway subsystem, and its components are inverter and generator.

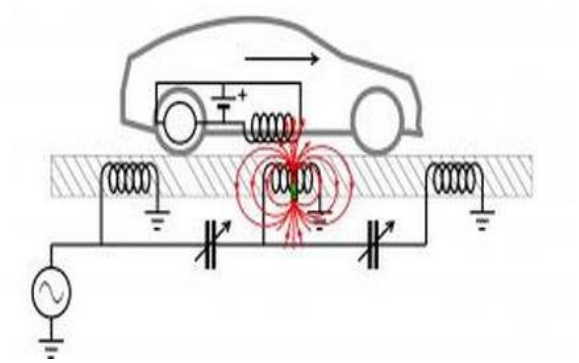
On-BoardSubsystem

Pick-upcoil,secondarycapacitor bank,rectifier is installed on the on-boardsubsystem.

WPT technology is based on the principle of magnetic induction. The process involves the transfer of energy between two coils that are placed near each other. The energy is transferred through a magnetic field that is generated between the two coils. The WPT technology used in electric cars is typically based on a resonant coupling mechanism, which enables the transfer of energy over longer distances than traditional inductive coupling mechanisms.

The development of wireless power-driven cars involves the integration of WPT technology into the design of the car.

This requires the installation of a wireless charging pad on the ground and a receiver coil on the car. When the car is parked over the charging pad, the receiver coil receives power from the charging pad, which is then used to charge the car's battery. The application of WPT technology in electric cars offers several benefits. One of the most significant benefits is increased convenience.



With wireless charging, drivers no longer need to physically plug in their car to charge it. This eliminates the needcumbersome cables and connectors and makes charging more accessible and convenient.

MATLABMODEL

StructureData

In this research paper we used MATLAB Model and Simulink with the help of our professor.

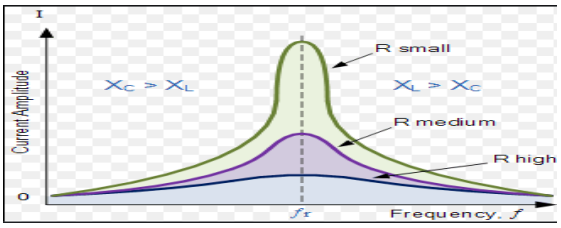
SoftwareInformation

We used MTLAB R2022b. For model block diagram we used Simulink in MATLAB. All the components like diode,inverter,capacitor is present in Simulink.

MainProcessforthisTechnology

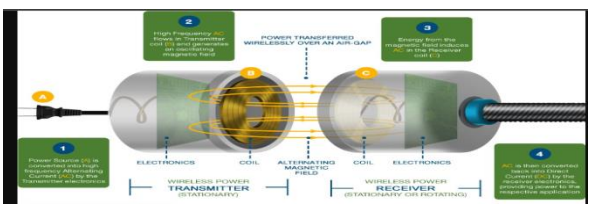
Werequirea Rectifier (ACtoDC),Highfrequencyinverter (DCtoAC),transmittingcoil,receivingcoil,ACsource,battery,DCmotor,connectingwires to complete this process.

In this technology we require dc power but as we know that dc power transmission is difficult, so we must first take ac power and convert it into clean dc by using rectifiers andcapacitor.



By doing this process some voltage mightdrops, to overcome this problem,

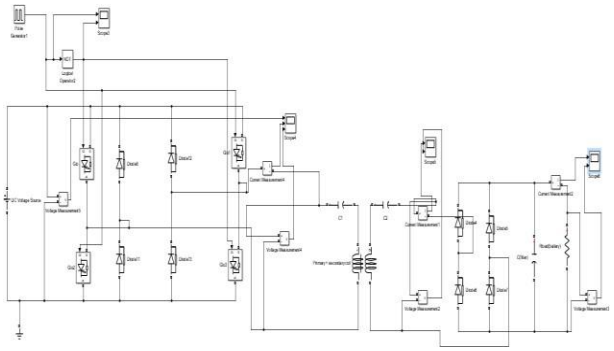
While converting ac into dc, voltage drop will take place to ignore this problem we must use ac power which has high frequency, this can be made possible by converting high frequency ac into dc and for doing so we require high frequency inverter. In our model resonance frequency plays an important role. Resonance frequency have inductive and capacitive frequency and both these frequencies will cancel out each other when in equilibrium.Mutual induction occur due to resonance frequency and as we have to transfer power wirelessly so we need the concept of mutual induction in our model.
In this model we have used the concept of mutual induction.In mutual induction there are two coils primary and secondary, in primary coil current is provided and current induces in the secondary coil through mutual induction.Here we get ac power, but we require dc power so at the end of secondary coil we must apply a rectifier which will convert ac power to dc power. In our result, the dc power is obtained at the secondary coil. Here is block diagram to clearly understand this process.



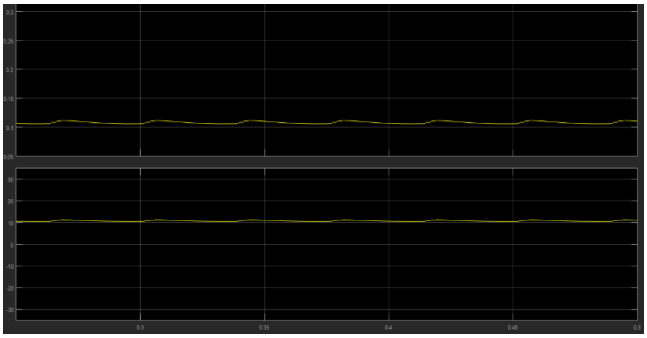
This block diagram is divided into two parts, in which the primary part is transmitter power electronics and secondary part is receiver power electronics.The primary part will be connected to the road and the secondary part will be connected to the vehicle.Power will be given to the primary side which is connected to the road. High frequency inverter is connected to the primary side, and it contains compensation network and current gain which is used to reduce loss when the process in primary sides get completed the power is ready to be transferred in the secondary part. The high frequency ac obtained at the secondary side goes to voltage gain and compensation network which is connected to secondary side.This ac supply is converted with the help of high frequency rectifier to dc supply.As a result we will get dc voltage as output.

Another benefit of WPT technology is reduced maintenance costs. Traditional wired charging systems require regular maintenance to ensure that the cables and connectors are functioning properly. With wireless charging, there are no cables or connectors to maintain, which reduces the maintenance requirements and costs associated with charging an electric car.

WPT technology also improves safety. Traditional wired charging systems pose a risk of electric shock and fire hazards. With wireless charging, there are no physical connections between the car and the charging pad, which eliminates the risk of electric shock and reduces the risk of fire hazards.



RESULT



The circuit that we made on MATLAB has two circuits one is primary, and another is secondary.In input the voltage applied is of 230 V.AC voltage is converted to dc voltage with the help of rectifier during this process there is a drop of 2 Volts so the Input voltage comes out to be 228 V.Inverter used is full wave bridge circuit which helps in converting input voltage which is 228 V DC voltage into high frequency AC voltage .Now we use the formula F=1/2pi*sqrt(L*C) for calculating the resonant frequency, after calculating the resonant frequency comes out to be 41530Hz ~ 41.5KHz.In the end, we get 228 V at both input and output of the inverter.The final voltage obtained at the rectifier side is 12v used to power other motors like BLDC motor.

CONCLUSION

In current scenario, Electric Vehicles are dependent on batteries but in our model, there is no such requirement as we must make it wireless. Its power will be more, and its range is also better than other electric vehicles. It has a quick and easy power supply. Wireless charging will provide many advantages compared to cable charging. In this project we avoid the physical connection requirement which leads to less faults in charging equipment in electric vehicles. The biggest and the best reason to use electric vehicles is that it'senvironmentally friendly. They do not need vicious that leads to air pollution and against the fossil fuels powered car.The application of WPT technology in the development of wireless power-driven cars offers several potential benefits, including increased convenience, reduced maintenance costs, and improved safety. However, there are also several challenges that need to be addressed, including the efficiency of the wireless charging system, the cost of the infrastructure, and concerns about the impact on human health and the environment.