Wireless Chargeable Eco-friendly Bus

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Abstract— Nowadays conventional buses which run on fuel results in release of the harmful gases such as CO2 which leads to increase in environment pollution ,global warming, this also affect the health of human being, along with these fuels which is used in buses is non-renewable source of energy and goes on decreasing day by day. In order to control the situation we are proposing a method in which instead of using a fuel in buses we are developing a electric bus. This bus is eco-friendly and uses renewable source of energy. Electric vehicles offer superior energy efficiency while offering an enormous Potential for reducing CO2 emissions if the electricity is supplied from a renewable or nuclear source. However, they are presently neither range- nor cost-competitive compared to conventional vehicles, due to limited options for recharging, and expensive energy storage (batteries). This system aims at extending the wireless power transfer to the charging of moving electric vehicles. As a optional part we are using a solar panel if in case bus get not fully charge through the circuitry. Along with this the BRT bus indication unit i.e. signalling system and verification system is also provided to verify the BRT bus and to indicate the status of the bus.

Key words: Electric Bus, Wireless Charging System E-Bus, Inductive Coupled Charging

I. INTRODUCTION

We can charge the battery using two methods they are wired and wireless. Inductive charging, also known as wireless charging, has found much successes and is now receiving increasing attention by virtue of its simplicity and efficiency. The most important distinctive structural difference between contactless transformers and conventional transformers is that the two 'coils' in the former are separated by a large air gap.

Compared with plug and socket (i.e., conductive) charging, the primary advantage of the inductive charging approach is that the system can work with no exposed conductors, no interlocks and no connectors, allowing the system to work with far lower risk of electric shock hazards. As the charging system is often fully enclosed, wireless charging can be realized in waterproof packages and as such, wireless charging is attractive in situations at which rechargeable devices need to be frequently used near or even under water as well as in humid conditions.

Broad application of wireless inductive-coupled contactless energy transfer systems is stymied by their fast declining efficiency performance as a function of wireless relative energy transfer distance. This relative measure is defined as the actual energy transfer distance divided by the radius of the wireless inductive energy transfer system. However, recent improvements in semiconductor technology provide an opportunity to almost gratuitously improve on the system efficiency, because a higher operating frequency, in general, benefits the inductive energy transfer .Applications, e.g., wireless charging of electrical vehicles by means of a magnetic coil in the road surface, thus become feasible and slowly become ready for a market introduction [1].

The success of this program may prove to be a very significant step forward towards the possibility of unlimited range electric mobility. By extending the range of electric vehicles, this project will contribute to overcoming a critical limitation of existing electrical vehicles, by offering range at competitive costs.

Physical separation between the primary and secondary windings incurs proximity-effect winding losses. Poor coupling can result in poor transmission performance and low efficiency. Due to the large air gap between the primary and secondary windings, contactless transformers have large leakage inductances, small mutual inductance and low efficiency. Compared to direct contact charging, inductive charging efficiency is lower and resistive heating is higher. [2].

II. RECENT WORK

Now-a-days buses which are in market operate on petrol or diesel. This buses generates pollution as well as gases which are harmful for human health. Solution for this china developed a BYD electric bus in which operate on battery for fully charged battery we require 6 amp for 5 hours. The BYD electric bus or BYD ebus called K9 in China, is an all-electric bus model manufactured by BYD powered with its self-developed Iron-phosphate battery, allegedly featuring the longest drive range of 250 km (155 miles) on one single charge under urban road conditions. BYD electric bus rolled off line on September 30, 2010 in Changsha city of Hunan province. This pure electric bus is another renewable energy vehicle by BYD following its models like F3DM, F6DM and e6.

The K9 has following specification:

1) Electric power consumption: less than 100kWh/60mins
2) Acceleration: 0–50 km/h in 20s
3) Top speed: 96 km/h
4) Normal charge: 6h for full charge
5) Fast charge: 3h for full charge
6) Overnight charging: 60 kW Max. power to fully charge the bus within 5h
7) Range: 155 miles (249 km) (186 miles (299 km) according to some reports)
8) Length*Width*Height: 12,000mm*2,550mm*3,200mm
9) Standard seats: 31+1 (31 for passengers and 1 for driver)
10) Weight: 18,000 kg [3]

In December 2013, Bangalore Metropolitan Transport Corporation, Bangalore, India has the ownership of K9 model of the BYD buses, and has plans to start operation of the bus from the second week of the month. If we compare Normal bus and BYD electric bus then we

observe things like: BYD system requires more investment cost than normal bus. But BYD bus is One Time investment service. So we think like that these buses are more useful now a day.

III. BLOCK DIAGRAM OF PROPOSED SYSTEM

This system is divided into two units Bus stop unit and Charging unit.In bus stop unit firstly we are checking the bus which is arrived is BRT or not. Only if the bus is BRT charging unit will be activated. Along with this we are display the status of the battery and location of the bus.

In charging unit we charge the battery by using magnetic field generation circuit.

A. Bus Stop Unit:

Fig. Block Diagram of Bus Stop Unit

The following are the important elements in the block diagram:-

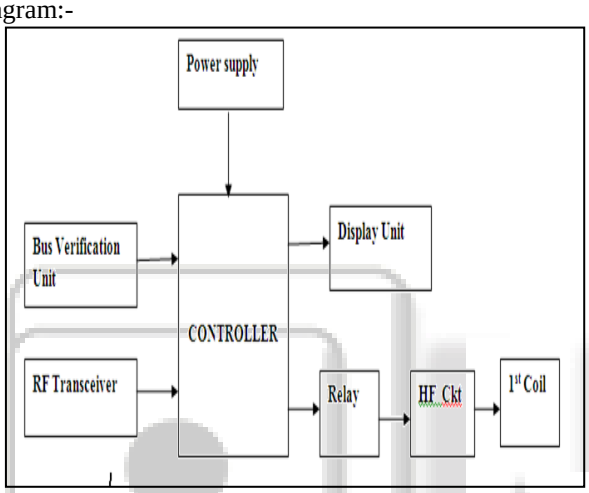

Fig. 1:

1) Microcontroller:

In our project for storing program and data we require a microcontroller AT89S52. Selection criterion of this and comparison with others are as follows:

	AT89S52	PIC	AVR
FLASH PROGRAM MEMORY	8K	4K/8K	2K
DATA MEMORY	128	192	128
PORTS	4	3-5	4
TIMERS	2	3	2
MICROCONTROLLER	8 bit	8 bit	32 bit
I/O PINS	32	22	15

Table 1: Comparison between Different Controllers

We use 89S52 microcontroller in system. The signals from the RFID reader are given to the Microcontroller. Microcontroller processes all these signals and gives data to LCD display.

2) Power Supply:

The ideal voltage for AT89S52 is 5V .And also we use 12V power supply for LCD & charging unit.

3) Bus Verification Unit:

For verification of bus that is either it is a BRT or not .The RFID reader along with RFID tag is used. RFID reader will generate the magnetic field and used to read the tag. Here we use the Passive RFID tag which has a inbuilt Microchip & antenna. The microchip has unique number store in it .The RFID tag is built in bus. RFID reader accesses the data store in the RFID tag & then passes it to the 89S52

We choose RFID reader over barcode technique because:

	RFID	BARCODE
Line of Site	Not required (in most cases)	Required
Read Range	Passive UHF RFID: - Up to 40 feet (fixed readers) - Up to 20 feet (handheld readers) Active RFID: - Up to 100's of feet or more	Several inches up to several feet
Read Rate	10's, 100's or 1000's simultaneously	Only one at a time
Identification	Can uniquely identify each item/asset tagged.	Most barcodes only identify the type of item (UPC Code) but not uniquely.
Read/Write	Many RFID tags are Read/Write	Read only
Technology	RF (Radio Frequency)	Optical (Laser)

Table 2: Comparison between RFID and BARCODE

The RFID are of two types Passive RFID and active RFID.We are using the passive RFID.

Passive RFID – identification system, in which the tags are not powered, is relying on active signals from the location transmitters for their response. This limits the range of the tags to a few feet.

4) Wireless Module:

It consists of RF transreceiver it is used to send the data to main station .The data consist of status of the bus. It will send the signal when the controller detects the BRT bus.RF transmitter is in the bus station and RF receiver is in the main station.RF transreceiver works at the frequency of 433.92MHz.

5) Specification of RF Transmitter:

1) Operating Voltage 3V to 12 V.
2) Operating Current M an x = 40mA (12V), M in = 9mA (3V).
3) Oscillator SAW (Surface Acoustic Wave).
4) Frequency: 433.92MHz.
5) Transmitting Power: 25mW (315MHz@12V).

6) Specification of RF Receiver:

1) Operating Voltage 5.0V ± 0.5V.

2) Operating Current=5.5mA @5.0V
3) Operating Principle Monolithic super heterodyne receiving
4) Bandwidth: 2MHz.
5) Transfer Rate < 9.6Kbps.

7) Display Unit:

It is used for the displaying the status of battery. We use LCD display for it. We choose LCD display because:

1) Very compact and light
2) Low power consumption
3) Very thin compared to a CRT monitor
4) No flicker depending on backlight technology.

8) Automatic Signaling System:

This block is used for to turn ON the charging unit when the detected bus is BRT bus. And also this is used for the signaling purpose i.e. location of bus.

This system consists of Relay & Relay driver circuit. It is used to turn ON the primary charging unit .When the RFID reader detect the BRT bus it will send the signal to microcontroller and controller will switch the relay from NO to NC.Then the primary circuit is active and starts the charging of bus. Relay driver used is the ULN2003 to drive the relay.

B. Block Biagram of Charging Unit:

Fig. 2: Block Diag of Charging Unit

1) Magnetic Field Generation Circuit:

A wireless power transfer system for electric vehicles is required to have high efficiency, a large air gap, and good tolerance for misalignment in the lateral direction and to be compact and lightweight. For this we think use 3 kW transformer to satisfy these criteria using a novel H-shaped core and split primary capacitors. The design procedure based on the coupling factor k, the winding's Q, and the core loss is described. An efficiency of 90% was achieved across a 200 mm air gap.The charging is done when the secondary comes in contact with primary.

2) Solar Panel:

To satisfy the increasing demand for power and reducing CO2 emission, the future generation system must meet the demand, reliability, efficiency and sustainability. This has accelerated the generation using solar system.[4]

If in case there is a problem for charging through main charging unit that time we can use solar panel as secondary source for charging. Secondary charging unit is also provide in the project i.e. solar panel.

– Advantages of solar PV

1) PV panels provide clean – green energy. During electricity generation with PV panels there is no harmful greenhouse gas emissions thus solar PV is environmentally friendly.
2) Solar energy is energy supplied by nature – it is thus free and abundant!
3) Operating and maintenance costs for PV panels are considered to be low, almost negligible, compared to costs of other renewable energy systems
4) PV panels have no mechanically moving parts, except in cases of –sun-tracking mechanical bases; consequently they have far less breakages or require less maintenance than other renewable energy systems (e.g. wind turbines)
5) PV panels are totally silent, producing no noise at all; consequently, they are a perfect solution for urban areas and for residential applications

IV. IMPLEMENTATION OF PROPOSED SYSTEM

1) Hardware: In this we are using Microcontroller 89S52.
2) Software: For programming 89S52 we use KEIL software. And for circuit implementation and testing we use MULTISIM and PROTEUS.

V. CONCLUSION

In this paper, a wireless energy transfer system based on transformer principle for power transmission and recharging of electrical devices is studied. This paper illustrates a method for wireless transfer of electric energy and information. This system is used for alimentation of moving load. The secondary can move in relation to the primary.

In short we are developing a charging unit based on wireless energy transform which charge the bus. The main purpose is reduce Co2 emission and fuel saving.

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