Dynamic Charging Kit For EV

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***Abstract*— The present Dynamic Charging Kit for EV is manual. In that kit Pantograph is used as the Current transferring medium. Because of use of the Pantograph in the kit we are able to Charge the EV while it is in the motion which will reduce the time forcharging as well as it will reduce the Anxiety of the Driver. The problem in current charging system is thatit takes lot of time to charge the EV and there is alwaysa fear of the loss of charging while driving. So, this Kit overcomes this problem of charging the EV.**

Keywords— Pantograph, EV.

INTRODUCTION

In recent years, the number of electric buses in Europe has strongly increased, and public transport operators (PTOs) are introducing BEBs into their fleet.However, several financial, organizational and technological barriers still exist that need to be addressed before the widespread adoption of BEBs. Financially, the high up-front capital cost of BEBs is one of the main hurdles. However, it has been reportedthat by 2030 at the latest, cost parity with diesel buses will be reached, because by then battery prices will have significantly reduced. Organizationally, finding the space to install the charging infrastructure and a plan to replace the current bus stock is necessary, as isthe consideration of long-term implications.

Technically, the major challenges are related to the charging infrastructure and the battery capacity. BEBs have a limited driving range compared with diesel buses and require dedicated high-power supply systems to support the charging demands. To overcomethe driving range limitation, bus operators need to investigate which vehicle types and charging technology are suited for the specific needs of the different bus routes in their city. Furthermore, the large-scale deployment of BEBs in cities will substantially negatively impact the electrical grid, creating component overloading, harmonic pollution, power loss, and voltage and stability issues. To mitigate them, the charging of BEBs needs to be properly managed.

PRESENT THEORY AND PRACTICES

Nikola Tesla created the conventional Inductive Power Transfer in 1914 to transmit power wirelessly. It draws inspiration from various EV charging systems. Inductive Power Transfer has been tested and used to transfer contactless power from the source to the receiver. It is used in numerous applications, ranging from milliwatts to kilowatts. The Chevrolet S10 EV released by General Motors (GM) in 1996, used the Magne-charge Inductive Power Transfer (J1773) system, which offered level 2 (6.6 kW) slow and level 3 (50 kW) fast charges. The primary coil of the magnetic-charge, also referred to as a recharging paddle(inductive coupler), was put into the vehicle’s charging port. Here, the secondary coil was supplied with electricity and permitted to charge the EV. The University of Georgia exhibited a 6.6 kW Level 2 EV charger that could operate at afrequency of 77 kHz and charge batteries with voltages between 200 and 400 V. A 10 KVA coaxial winding transformer provided significant benefits in this universal Inductive Power Transfer, including a flexible inductive coupling design and an easily modifiable power-range.

LITERATURE REVIEW

A deep review of the state of the electromobility in urban public transport by bus was conducted from all different charging strategies, types of chargers, and e- buses with a general overview and SWOT analysis. A review of five case studies worldwide was also conducted and a real case study with real data was shownin depth: EMT Madrid, where all chargers and charging systems were developed in a single operation center. Total Cost of Ownership (TCO) from the literature and from the case study for e-buses were shown as comparedwith different bus technologies The ever-increasing concerns over urban air quality, noise pollution, and considerable savings in total cost of ownership encouraged more and more cities to introduce battery electric buses (e-bus).

PROPOSED WORK

Current system involves the research on how the pantograph can be used for the In-motion charging of the e-buses and the proposed working for the same is given as below.

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A. Block Diagram

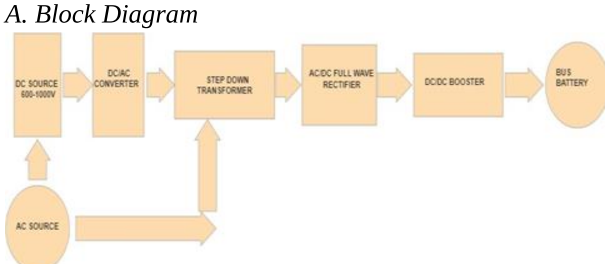

Fig.1: Block Diagram

B.Circuit Diagram

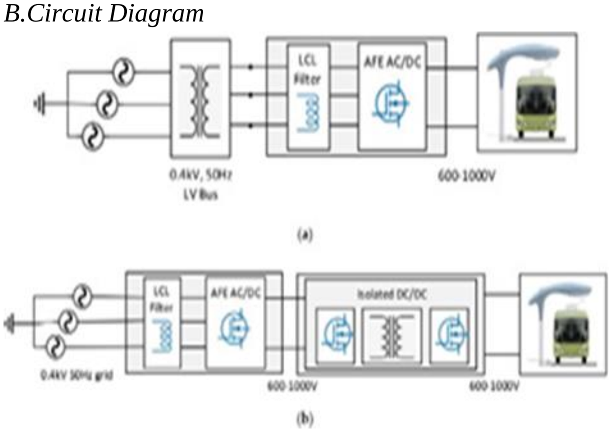

Fig.2: Circuit Diagram

METHODOLOGY

Methodology will include the steps to be followed to achieve the objective of the project during the project development.

1.The development of battery technology enabled theE-bus to become one viable solution in the electrification strategy of cities RPM.

2.Charging Indicator gives the idea of charging speed.

3.While driving, the trolleybus charges its on-board batteries, which enables in average, for each km under the catenary to drive one, two or even three km without catenary in commercial conditions.

4.We take in the typical 230V AC and convert it to 750V DC at 500amps to have level 3 type of fast charging at 350-375kw.

5.Meaning we will be charging an average E-bus(400kwh) with charging speed of one hour.

6.Dynamic charging model for 375 kW energy transfer enables maximum recharging

Hardware:

COMPONENTS REQUIRED

Functional Block Diagram

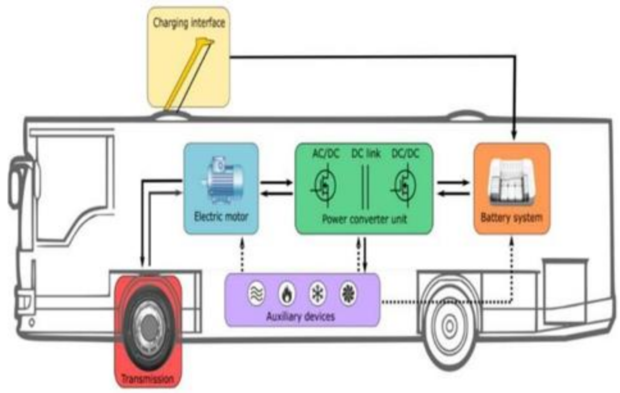

Fig.3: Functional Block Diagram

1) TP4056:

The TP4056 is a complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries.Its SOP package and low external component count make the TP4056 ideally suited for portable applications. Furthermore, the TP4056 can work within USB and wall adapter. No blocking diode is required due to the internal PMOSFET architecture and have prevent to negative Charge Current Circuit. Thermal feedback regulates the charge current to limit the die temperature during high power operation or high ambient temperature. The charge voltage is fixed at 4.2V, and the charge current can be programmed externally with a single resistor. The TP4056 automatically terminates the charge cycle when the chargecurrent drops to 1/10th the programmed value after the final float voltage is reached. TP4056 Other features include current monitor, under voltage lockout, automaticrecharge and two status pin to indicate charge terminationand the presence of an input voltage.

3) SG90 Servo Motor:

Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kindsbut with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware. smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller.

Fig.4: TP4056

2) 18650 Li Ion battery:

lithium-ion batteries can have a variety of positive and negative electrode materials, the energy density and voltage vary accordingly.

The is higher than in aqueous batteries (such as lead–acid, nickel–metal hydride and nickel-cadmium).[153][*failed verification*] Internal resistance increases with both cycling and age,[154] although this depends strongly on the voltage and temperature the batteries are stored at. Rising internal resistance causes the voltage at the terminals to drop under load, which reduces the maximum current draw.

Eventually, increasing resistance will leave the battery in astate such that it can no longer support the normal discharge currents requested of it without unacceptable voltage drop or overheating.

Batteries with a lithium iron phosphate positive and graphite negative electrodes have a nominal open-circuit voltage of 3.2 V and a typical charging voltage of 3.6 V. Lithium nickel manganese cobalt (NMC) oxide positives with graphite negatives have a 3.7 V nominal voltage witha 4.2 V maximum while charging.

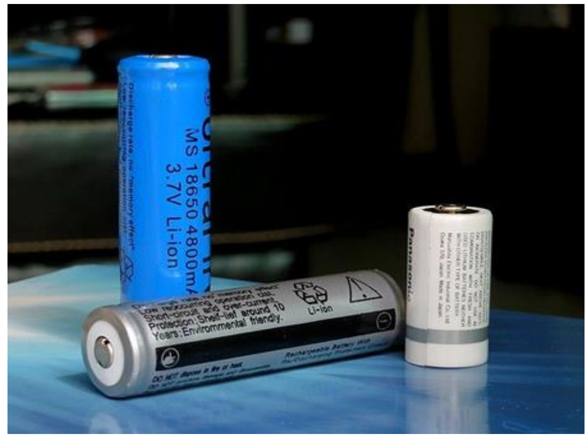

Fig.5: 18650 li-ion battery

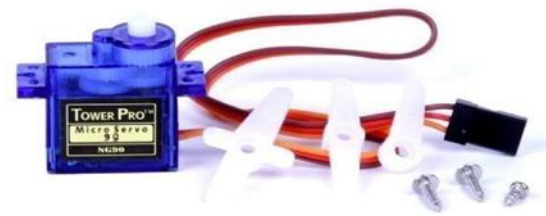

Fig.6: SG90 Servo Motor

3) *DC Motor:*

A direct current (DC) motor is a type of electricmachine that converts electrical energy into mechanical energy. DC motors take electrical power through direct current, and convert this energy into mechanical rotation. DC motors use magnetic fields that occur from the electrical currents generated, which powers the movement of a rotor fixed within the output shaft. The output torque and speed depends upon both the electrical input and the design of the motor.

Fig.7: DC Motor

5v 2a Adapter:

DC 5V/2A, means that the input voltage, to recharge the battery is 5 volts of direct current. It has two outputs, one 2.1A USB (for tablets and Raspberry Pi and high-current devices, the other 1A USB for phones and smaller devices with feedback & gear box, especially since it will fit in small places.It comes with a 3 horns (arms) and hardware.

Fig.11: 5v 2a Adapter

RESULT

Fig-12

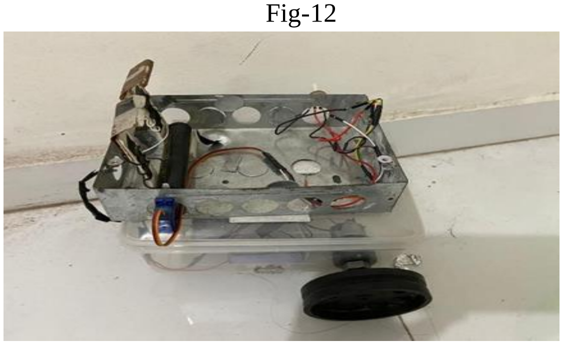

Fig-13

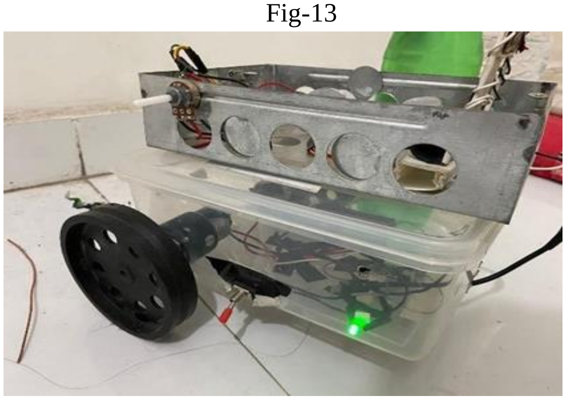

Fig-14

CONCLUSION

Overall, the following points can be drawn as a conclusion: The best charging technology depends on operational needs. There is no single solution and each bus company will study the one that best suits their needs. According to the analysis, the most innovative cities choose solutions with a combination of pantographs and cable. The better and the more efficient the batteries develop in the future, the more important the recharging technology becomes, thus the efficient transfer of energy from the infrastructure into the vehicle. At the moment, overhead wires with the In Motion Charging concept with 500kW power transfer is by far the most powerful concept. Therefore, trolleybuses with In Motion Charging system often generate the lowest operating cost. The laws of physics (energy transfer for charging = charging power x charging time) confirm the benefits of In Motion Charging since it allows sufficient charging time as well as high power.

REFERENCE

[1] Mr. Iván López, Pedro Luis Calvo: Different Approaches for a Goal: The Electrical Bus-EMT Madrid as a Successful Case Study., 2022.

[2] Wang, S.; Lu, C.; Liu, C.; Zhou, Y.; Bi, J.; Zhao, X. Understanding the Energy Consumption of Battery Electric Buses in Urban Public Transport System. Sustainability 2020, 12, 10007.

[3] Sustainable Bus. 2019. Available online: https://www.sustainable-bus.com/news/5-per-cent-of-city-buses-registered-in-2018-in-europe-were-electric-buses/ (accessed on 22 April 2022).