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Technical Paper on Future of E Vehicle

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Abstract- E Vehicle Introduction In an era where energy conservation has become the latest topic of discussion not only among the scholars but also among the ordinary responsible citizens, fuel efficiency along with minimum pollution has become the benchmark for any new automobile. And in the same context "E vehicles " come as the latest addition. By the name itself it can be inferred that a E vehicles car is better option to the traditional engine car.

Index Terms- EV-Electrical Vehicles, BEV- Battery electric vehicle

I. INTRODUCTION

As more and more people catch on to the wave of the automotive future - the hybrid car, more and more questions arise regarding these efficient, but somewhat mysterious vehicles. But just how do they work?, are they reliable enough?, and are they capable of being the car of the future? What is an EV? An EV is a road vehicle based on modern electric propulsion consisting of electric machines, power electronic converters, electric energy sources and storage devices, and electronic controllers.

II. CONTENTS

1. History of EV

The invention of the first model electric vehicle is attributed to various people. In 1828, Ányos Jedlik invented an early type of electric motor, and created a small model car powered by his new motor. Between 1832 and 1839, Scottish inventor Robert Anderson also invented a crude electric carriage. In 1835, Professor Sibrandus Stratingh of Groningen, the Netherlands and his assistant Christopher Becker powered by non-rechargeable primary cells. The first mass-produced electric vehicles appeared in America in the early

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1900s. In 1902, the Studebaker Automobile Company entered the automotive business with electric vehicles, though it also entered the gasoline vehicles market in 1904. However, with the advent of cheap assembly line cars by Ford, the popularity of electric cars declined significantly.

2. EV Concept

An electric car is a car that is propelled by one or more electric motors, using energy stored in rechargeable batteries. Compared to internal combustion engine (ICE) vehicles, electric cars are quieter, have no exhaust emissions, and lower emissions overall. In the United States, as of 2020, the total cost of ownership of recent EVs is cheaper than that of equivalent ICE cars, due to lower fueling and maintenance costs. Charging an electric car can be done at a variety of charging stations; these charging stations can be installed in both houses and public areas.

3. **Environmental aspects**

Electric cars have several benefits over ICE cars, including a significant reduction of local air pollution, as they do not directly emit pollutants such as volatile organic compounds, , ozone, hydrocarbons , carbon monoxide, lead, and various oxides of nitrogen. Depending on the production process and the source of the electricity to charge the vehicle, emissions may be partly shifted from cities to the plants that generate electricity and produce the car as well as to the transportation of material. The amount of carbon dioxide emitted depends on the emissions of the electricity source and the efficiency of the vehicle. For electricity from the grid, the emissions vary significantly depending on the region, the availability of renewable sources and the efficiency of the fossil fuel-based generation used.

4. **Component of EV**

The component of EV includes

a. Motor

b. Controller

c. Charger

d. DC/AC Converter

e. Contactors

f. Batteries

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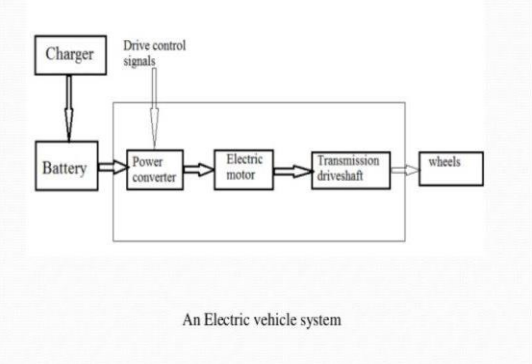

Fig.1 E-Vehicle System

a. Motor: An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators

b. Controller: As of 2018, most electric cars have similar driving controls to that of a car with a conventional automatic transmission. Even though the motor may be permanently connected to the wheels through a fixed-ratio gear, and no parking pawl may be present, the modes "P" and "N" are often still provided on the selector. In this case, the motor is disabled in "N" and an electrically actuated hand brake provides the "P" mode.

c. c. Charger: Electric cars are typically charged overnight from a charging station installed in the owner's house, or from faster charging stations found in businesses and public areas.

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d. DC/AC Converter:

Usually, direct current (DC) electricity is fed into a DC/AC inverter where it is converted to alternating current (AC) electricity and this AC electricity is connected to a 3-phase AC motor. For electric trains, forklift trucks, and some electric cars, DC motors are often used. In some cases, universal motors are used, and then AC or DC may be employed. In recent production vehicles, various motor types have been implemented; for instance, induction motors within Tesla Motor vehicles and permanent magnet machines in the Nissan Leaf and Chevrolet Bolt.

e. Contactors:

A contactor is an electrically-controlled switch used for switching an electrical power circuit. A contactor is typically controlled by a circuit which has a much lower power level than the switched circuit, such as a 24-volt coil electromagnet controlling a 230-volt motor switch.

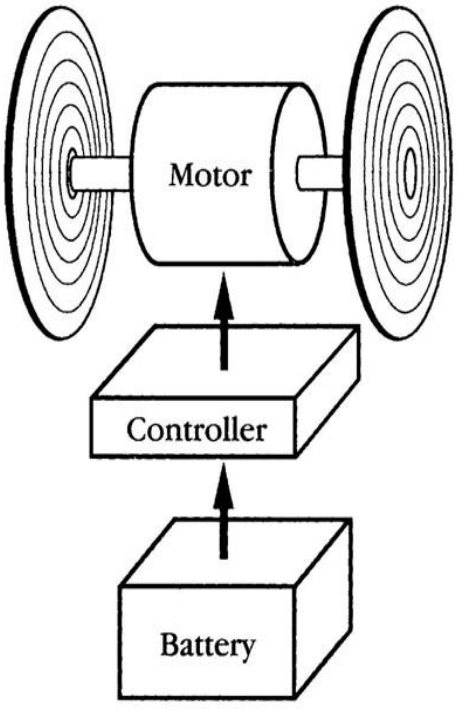

Fig2. Control System

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f. Batteries:

Most electric vehicles use lithium-ion batteries (Li-Ions or LIBs). Lithium ion batteries have higher energy density, longer life span and higher power density than most other practical batteries. Complicating factors include safety, durability, thermal breakdown and cost. Li-ion batteries should be used within safe temperature and voltage ranges in order to operate safely and efficiently

5. Future of EV

The electric vehicle (EV) revolution is speeding up, but it can only go so far without the necessary infrastructure and technology. As thinking shifts from fossil fuels to all-electric, visions of a brighter, more optimistic world come into view. The UK government's pledge to ban the sale of all new non-electric cars, including gasoline, diesel and hybrid vehicles from 2035, highlights the drive to end the nation's contribution to Climate Change by 2050.

India has a lot to gain from the widespread adoption of e-mobility. Under the Make in India program, the manufacturing of e-vehicles and their associated components is expected to increase the share of manufacturing in India's GDP to 25% by 2022. On the economic front, large-scale adoption of electric vehicles is projected to help save $60 billion on oil imports by 2030 - currently 82% of India's oil demand is fulfilled by imports. Price of electricity as fuel could fall as low as Rs 1.1/km, helping an electric vehicle owner save up to Rs. 20,000 for every 5,000km traversed. Finally, electrification will help reduce vehicular emissions, a key contributor to air pollution which causes an average 3% GDP loss every year

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Currently, charging infrastructure for e-mobility is an area of concern; however, there have been some positive developments. Delhi recently legalized charging stations for e-rickshaws and hopes that with more incentives, civic agencies and private players would step forward. NTPC, India's largest power generation utility, has already commissioned its first EV charging station - designed in-house with a capacity to charge three electric vehicles simultaneously - in Vishakhapatnam.

The most crucial aspect of the e-mobility ecosystem is, of course, the electric vehicle itself. In India, public transport is leading the way for mainstreaming of e-mobility. E-rickshaws are mushrooming as public transport

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in Indian cities due to lower cost of operation and economical fares. Delhi alone is believed to have almost lakh e-rickshaws plying its roads, while Kolkata will see an upgrade from totos to e-rickshaws soon. The recent jump in electric vehicle sales also point to a rising preference for personal electric vehicles.

Apart from efficiency, safety is also important in determining the ultimate viability of electric vehicles. A lot can be achieved by reducing overall vehicle mass, protecting against flammability and short circuiting and using highly engineered materials which can withstand physical and chemical degradation. One of the solutions is BASF's Ultramar range of plastics that can be used to create cell frames and casings because of its high-strength and temperature-resistant properties. Casings made of thermoplastic can achieve up to a 30% mass reduction in comparison to metals.

To reduce energy usage, BASF has also developed a line of cool pigments to help control cabin temperature; the darker shades and colors absorb up to 90% of the sun's heat. These modifications are especially beneficial in vehicles equipped with bigger batteries capable of longer ranges, since they tend to be burdened with additional pounds and show a greater need for heat management.

E-mobility research tends to be complex due to the varied demands of the different kinds of electric vehicles. Industries are at the forefront of e-mobility solutions with its R&D in advanced battery materials, engineered plastics and pigments/ coating solutions.

6. **Advantages**

- Reduce dependences on oil and gasoline.
- Pollutants and noise free.
- Recyclable batteries.
- No fire hazards.
- Low maintenance and operation cost.

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III. Conclusion

We have seen massive changes, particularly in terms of technology, but also in terms of people's attitude towards cars' environmental impacts and other mobility solutions, from the first electric car established in 1837 up to the present time. Although the electric vehicle market is currently a lucrative goal for companies and start-ups in India, several obstacles still remain to be addressed in order for EVs to be ready for mass adoption. High-cost barriers include, for example, manufacturing electric vehicles domestically.

Similarly, battery manufacturing is essentially a costly venture. The Indian Government must concentrate its energies on promoting technological disruption to resolve these challenges. The government would also need to provide enhanced tax incentives and subsidies to potential car owners and suppliers in order to quicker adoption of EVs.

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