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### Special Issue of Second International Conference on Innovation in Engineering Sciences (ICIES2021) Fundamentals of Electric Vehicle Components Applying Renewable Source Energy

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#### Abstract

*This write-up describes some thoughts on how the electric vehicle can be operated on Natural Energy as well as Artificial Energy. During the day hours too long efforts can be made by putting solar panels and save maximum power to run the electric vehicle; even at night time driving it can be operated over a battery. The fundamentals of both the systems are deeply elaborated in the successive paragraphs. We have studied; analysed and further thought process concluded us that let's use maximum solar energy during peak periods and for night time run the vehicle on battery. All the basic components related with electrical vehicle batteries are elaborated in the write-up. The further research on saving the solar energy in battery is in progress.*

**Keywords:** *Electric Vehicle, Solar Energy, Artificial Energy, Battery, Fuel.*

#### 1. Introduction

It was the year 1886, when the first vehicle was invented. At that time the vehicle was made of gasoline engine. This engine worked on petrol and diesel fuels. Also this engine contained various moving parts which were to be lubricated after some time interval. These fuels are non-renewable energy sources and now the prices of this fuel are also touching the sky. Therefore there is a need of a vehicle which can work on renewable energy source. Thereafter various experiments took place to build a vehicle which can run on water or wind power or any other renewable energy source. At that time it was difficult to build such type of engine. It was in the year 1971, first electric vehicle was invented.[1-6] As the time has passed electric vehicle or EV has become a good vehicle to have under your hood. This decision is now easier to be made as the prices of fuels have risen to the sky. Also the rising of pollution can make people go environment friendly to opt for EVs. EVs are smooth to start and do not need any fuel to start

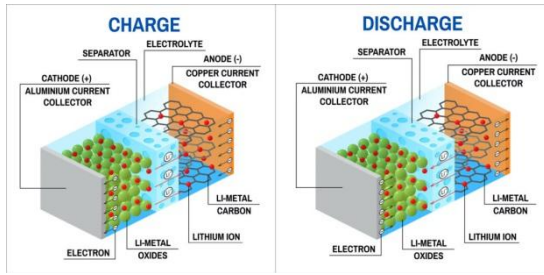
its engine. In fact the EVs do not have any engine in them. They are directly operated with the help of electricity stored in the batteries. Needed for special purposes.

#### 2. Methodology:-

The EVs use electricity stored in the batteries with the help of electric motor. To add to this we can add a solar panel to this so that the car can be operated on the solar energy by the day time and then it can be operated on the battery by the night time. The following are the components present in an EV:-

##### 2.1 Battery:-

This is the main component of the Electric Vehicle.[2] This component is used to store electricity. Now a days Lithium ion batteries are used in the EVs. Before these batteries Nickel-Cadmium batteries were used.[3] Lithium Batteries used because they run for a long period of time. To be specific these batteries run for 8 hours of time in practical. It is the latest technology and is used in the recent vehicles.



**Fig.1:- Lithium Ion Battery [7]**

**2.2 Motor:-**

Brushless D.C. motor is used in the electric vehicles as of today. This type of motor is used because of its many benefits. Compact size, quick responsive, Low maintenance, No brush which can cause sparking, high operating speed, Efficiency from 85-90% are some advantages of the motor used in the Electric Vehicle.



**Fig. 2:- BLDC Motor [8]**

**2.3 Power Invertors:-**

The function of this component is to convert Direct Current (DC) which is stored in the battery to Alternating Current (AC) which is then utilized by the motor. In addition to this function the power inverter is also used in helping of regenerative braking also to recharge the battery. There are two types of Power Invertor one is single direction power inverter in which the regenerative braking is not possible and second bi-directional power inverter in which the regenerative braking is possible. In current EVs the second type of power inverter is used so as to make more use of its functions.



**Fig.3:- Power Invertors [9]**

**2.4 Controller:-**

This component is just like the ECU which is used in the conventional vehicles. It also acts as the regulator of electrical energy from the battery and Inverter to pass it on to the electric motors. This component itself gets the fire power as the driver presses the accelerator pedal.<sup>[3]</sup> The controller will ensure about the voltage to be supplied to the electric motor to achieve the rated speed of the vehicle.



**Fig.4: Electric Controller [10]**

**2.5 Charger:-**

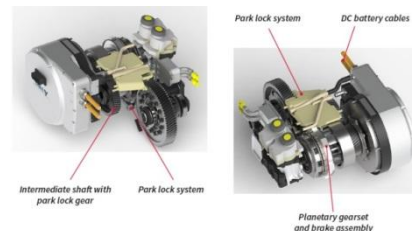
As the name suggest this component is used to charge the batteries of the vehicle. It also converts the Alternating Current to Direct Current and helps the current to store in the batteries. For Electric Vehicles there are 2 types of the chargers one being the on board charger and the other one being the off board charger.



**Fig.5: Electric Car Charger [11]**

**2.6 Transmission:**

The transmission transfers mechanical power from the electric traction motor to drive the wheels.



**Fig.6: Electric Transmission [12]**

### 2.7 DC/DC Converter:-

This one of electric car parts that to converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery.



**Fig.7: DC/DC Converter [13]**

### 2.8 Charging Port:-

The charge port allows the vehicle to connect to an external power supply in order to charge the traction battery pack.



**Fig.8: Charging Port [14]**

### 2.9 Solar Panels[5]:-

We can add these panels to the roof of the vehicle so that the vehicle can operate on solar power in the day time and then we can use the battery power at the night time. Also we can charge the lithium ion battery using the solar panels as well.<sup>[6]</sup> These panels can be fitted on the rear half of the roofs as there are many vehicles coming up with sunroof in the current scenario.



**Fig.9: Solar Panel on roof of Car [15]**

### Pros:-

- They are easier on the Environment.
- Electricity is cheaper than gasoline.
- Maintenance is less frequent.
- They are very quiet.
- They can shorten your commute time.
- You will get tax credits.

### Cons:-

- Most EVs have pretty short ranges.
- Recharging can take a while.
- They are a large initial investment.
- Charging station availability is inconsistent.
- There are fewer choices.

### Conclusion:-

In this paper, we have tried to implement the idea to run an Electric Vehicle on Natural Energy (Solar Energy) as well as Artificial & Green Energy (Battery) to reduce burden on fossil and costly fuels which are not eco-friendly.

### Future Scope:-

Our further efforts & research would be to save maximum natural energy in the battery are in process and shortly the outcome will be displayed.

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