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Research Article

A Comprehensive Study on Electric Vehicles: Operation, Comparison, and Future Prospects

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ABSTRACT

Due to the problems caused by the gasoline engine on the environment and people, the automotive industry has turned to the electrical powered vehicle. This report explains how an electric vehicle works and compares the electric vehicle to the internal combustion engine and hybrid vehicle. The report provides some of the advantages and disadvantages of the electric vehicle. In addition, a brief future view of the technology is given. At a time when the fuel prices are rocketing sky high , the daily running cost of a vehicle and its cost of ownership are hitting the roof and there is a dire need to protect our environment , alternative means of transport are few . Electric vehicle are slow expensive with limited range the solution comes in the form of
Electrical vehicle.

Keywords: Electric Vehicle (EV), Internal Combustion Engine (ICE), Hybrid Vehicle, Sustainable Transportation, Battery Technology,

I. INTRODUCTION

India is one of the top ten automotive markets in the world today and having highly increasing middle class population with buying potential and the steady economic growth. But petrol price has increased more than 50% in 13 different steps in last two years. Here comes the potential need for alternative technologies in automobiles such as electric vehicles (EV) in India. Although the initial investment is around 1.5 times than conventional IC engine, but time has come when cost of environment is now more concern than the cost of vehicle The purpose of this report is to describe the technology used to produce an electric vehicle and explain why the electric engine is better than the internal combustion engine. It includes reasons why the electric vehicle grew rapidly and the reason it is a necessity to better the world today. The report describes the most important parts in an electric vehicle and hybrid vehicle. It compares the electric to the hybrid and internal combustion engine vehicle. It also includes the future of the electric vehicle. The overall impact of the electric vehicle ultimately benefits the people. Compared to gasoline powered vehicles, electric vehicles are considered to be ninety-seven percent cleaner, producing no tailpipe emissions that can place particulate matter into the air. articulate matter, carcinogens released into the atmosphere by gas-powered vehicles, "can increase asthma conditions, as well as irritate respiratory systems"[1]. The paper begins with a history of the electric vehicle, specifically the lows and highs of Production and the reasons for the change. The next section provides a technical description of an electric vehicle, including the parts, their functions, and the theory of operation. The following section describes the hybrid car, including parts, their functions and the theory of operation. Based on this understanding, I then compare the internal combustion engine, the hybrid engine, and the electrical engine in terms of efficiency, speed, acceleration, maintenance, mileage, and cost. The paper concludes with sections the advantages and disadvantages of the electric vehicle.
An electric vehicle (EV), also referred to as an electric drive vehicle, uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources, or may be self-contained with a battery or generator to convert fuel to electricity. [1] EVs include road and rail vehicles, surface and underwater vessels, electric raft and electric spacecraft.
EVs first came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. The internal combustion engine (ICE) has been the dominant propulsion method

for motor vehicles for almost 100 years, but electric power has remained commonplace in other vehicle types, such as trains and smaller vehicles of all types.

II. BASIC SCHEME

1. The proposed idea of electric vehicle is suitable for the location where price of petrol and diesel are high and the rate emission of flue gas is high
2. This scheme has generate electricity through dynamo.

III. WORKING OPERATION

The electric vehicle (EV) is propelled by an electric motor, powered by rechargeable battery packs, rather than a gasoline engine. From the outside, the vehicle does not appear to be electric. In most cases, electric cars are created by converting a gasoline-powered car. Often, the only thing that clues the vehicle is electric is the fact that it is nearly silent.

Under the hood, the electric car has: An electric motor.
A controller.
A rechargeable battery.

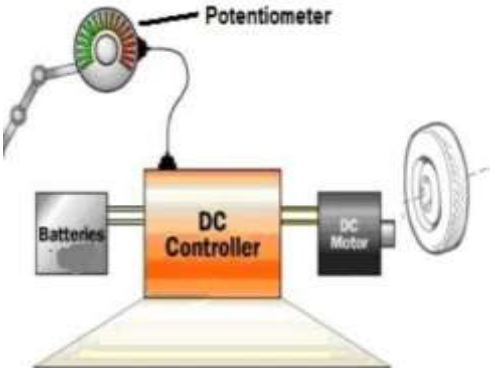


Fig:1 Basic block diagram

Fig:2 Chassis of vehicle

The electric motor gets its power from a controller and the controller gets its power from rechargeable battery.
The electric vehicle operates on an electric/current principle. It uses a battery pack (batteries) to provide power for the electric motor. The motor then uses the power (voltage) received from the batteries to rotate a transmission and the transmission turns the wheels. Four main parts make up the electric vehicle: the potentiometer, batteries, direct current (DC) controller. The three main component of electric bike are electric motor , controller and battery . When you switch on the bike , the current is passed from the battery . The controller takes power from the battery and passing the current to motor, before passing the current to motor .
The electrical motor the convert electrical energy to mechanical energy. The mechanical energy moves the vehicle. Controller stands as the buyer of power from battery and gives out power to motor accordingly. Variable potentiometers are connected between accelerator and the controller. These potentiometers tells the controller how much power it is supposed to deliver. When the accelerator is released it deliver 0v and the are fully pressed, it gives maximum output.

IV DESCRIPTION OF PARTS AND THEIR FUNCTIONS

a) Potentiometer. It is circular in shape and it is hooked to the accelerator pedal. The potentiometer, also called the variable resistor, provides the signal that tells the controller how much power is it supposed to deliver.

TABLE I. ACCELERATOR / THROTTLE-

Supply Voltage (V)	48
Return Voltage (V)	4
Max. Load output current (A)	15.625
Handle Bar Diameter (mm)	22
Three wires red, green, black	May differ from works Fit for 48 v supply

b) Batteries. The batteries provide power for the controller. Three types of batteries: lead-acid, lithium ion, and nickel-metal hydride batteries. Batteries range in voltage (power).

c) Battery specification- Power = Voltage x Current P = V. I
750 = 48 x I
I = 15.625 Ah
Hence according to the above calculations, to drive motor of 750 W, 48 V capacity; we select 4 batteries of 12V 33Ah. We connect these batteries in series to achieve a voltage of 48
V as required by the motor

d) Electrical charging-
Time required to fully charging the battery is calculated. Power Supplied to Battery during AC Charging: AC Adapter Specification: 48 V, 5 A
P = V. I
P = 48 x 5
P = 240
Therefore the time required to charge the battery completely is:
t = 720 ÷ 240
t = 3 hours
Hence, it is found that, the time required to charge the batteries completely is 3 hours

IV. DC CONTROLLER.

The controller takes power from the batteries and delivers it to the motor. The controller can deliver zero power (when the car is stopped), full power (when the driver floors the accelerator pedal), or any power level in between. If the battery pack contains four 12-volt batteries, wired in series to create 48volts, the controller takes in 48 volts direct current, and delivers it to the motor in a controlled way. The controller reads the setting of the accelerator pedal from the two potentiometers and regulates the power accordingly. If the accelerator pedal is 25 percent of the way down, the controller pulses the power so it is on 25 percent of the time and off 75 percent of the time. If the signals of both potentiometers are not equal, the controller will not operate


Fig:2 DC Motor Controller

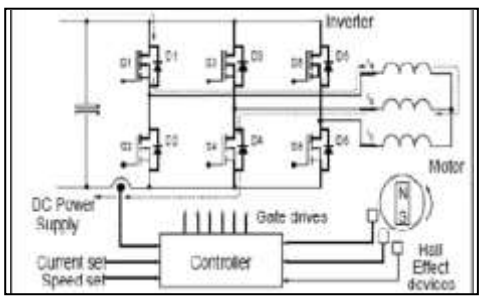


Fig: 3 Controller

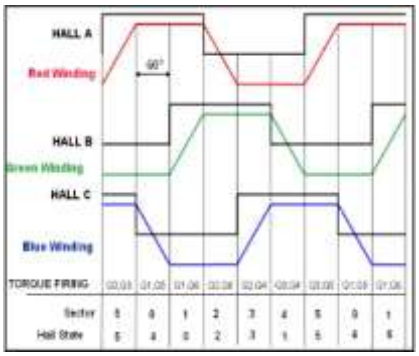


Fig: 4 Output voltage pattern

Motor. The motor receives power from the controller and turns a transmission. The transmission then turns the wheels, causing the vehicle to run.

Motor calculations-

Since the total Solar EV weight is equal to 174 kg the Normal reaction acting on each tyre is equal to (87 x 9.81) Newton each.

Friction force acting on the tire- $F = \mu N1$

$F = 0.3 \times 853$ $F = 255$ N

Torque required-

$T = F \times r$

$T = 255 \times 0.19$ $T = 49$ Nm

Speed calculation-

$\omega = v \div r$, $\omega = (10 \times 1000) \div (0.19 \times 3600)$

$\omega = 14.61$ rad /sec $\omega = (2 \pi N) \div 60$

$N = (60 \times 14.61) \div (2\pi) = 140$ rpm

Power calculations-

$P = (2 \pi N T) \div 60$

$P = (2 \pi \times 140 \times 49) \div 60$

P= 720 Watt (Approx)

The solar power is used as a supplementary energy to ride the Solar EV . A motor with power of 750 W is selected [2]


Fig:5 Hub Motor

V. SOLAR PANEL

The solar panel is photovoltaic converter which works only in bright sunlight. If cloud blocks the sun rays or during night the solar panel does not work. To make the solar energy available throughout the day, a solar charger is incorporated.

Maximum Power (Watt)	75 W
Charging current (Amp)	4.16
Open Circuit Voltage (V)	25
Max Power Voltage (V)	18 V
Short Circuit Current	**8.31**
Power Measured at Standard Test Condition	1000 W per m2 at 25° C
Lifespan	25 years

VI. SEQUENTIAL SWITCHING CIRCUIT

It will work as a switching between solar panel and battery. Battery will connected to solar panel for 10 Min alternately.

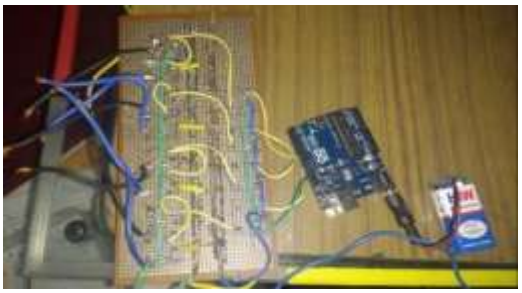
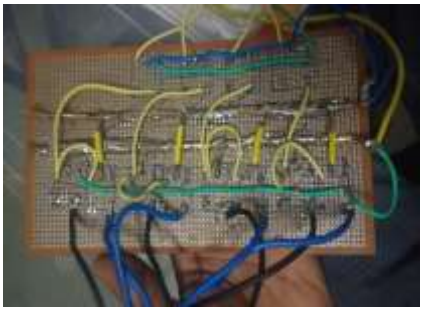


Fig:6 Sequential switching circuit



Fig;7 Sequential switching circuit

VII. EMISSIONS

Compared to gasoline powered vehicles, electric vehicles are considered to be ninety - seven percent cleaner, producing no tailpipe emissions that can place particulate matter into the air Global Warming: Ozone Layer The process of carbon dioxide emitted into the atmosphere, also known as global warming, diminishes the Earth's ozone layer, which is what occurs at this time. A factor
that makes electric vehicles clean is their ability to use half the number of parts gasoline powered vehicle does, including gasoline and oil.

VIII. CONCLUSION

As seen in this report, the electric vehicle has many advantages and benefits over the internal combustion engine. It is cleaner and much more efficient; however, it also has disadvantages. It is heavier, limited to the distance it can travel before recharge, and costs more. The future of the EV relies on its battery. If researchers can produce or find the"super battery", the EV's future is promising. As of today, each vehicle has its own characteristic that makes it better than the other. Only time and technological improvements will tell which vehicle will excel in the future. The above proposed project named " ELECTRIC VEHICLE" will be designed on the objective of providing an alternative source of transportation as well as an economical we believe this project, if effectively used may be considered as an innovative and a good solution for the large emission of CO_2 as far as a developing nation like India is concerned

Fig:-7 Final Image of vehicle

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