



Multi Source Eco Hybrid Vehicle

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Abstract:

Growing need for an efficient and less polluting vehicle has lead the Industry to turn about and think about the future of automobile industry. Depletion of conventional fuel has force the automobile industry to look for alternate fuel. The present scenario has projected automobiles as pollution generators. So an alternate has to be efficient and clean in emissions. Alternative to a I.C engine isn't as easy as it seems because even after 100 years of the invention of internal combustion engine, it has only evolve but nothing has come even close to it in case of replacement of I.C engine.

In our case we have decided to built a hybrid vehicle which is a combination of conventional internal combustion engine and electric motor for propulsion, there are many from of hybrid vehicle such as series hybrid, parallel hybrid & series parallel hybrid. Our project is based on parallel hybrid vehicle, which means both the internal combustion engine and electric motor are independent to propel the vehicle. Hybrid vehicles present in cars today's are costly and are out of common man's reach who can afford a small family car.

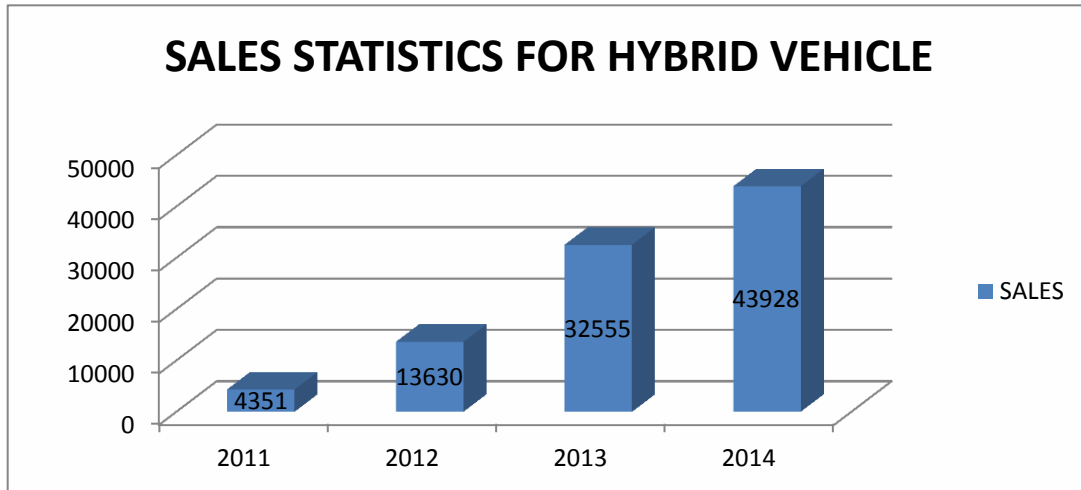
Keywords: Hybrid; Economic; Low Emission; Electric Motor; Controller; Battery

INTRODUCTION:

1. LITERATURE SURVEY:

Hybrid vehicles aren't new in the automobile society Ferdinand Porsche designed the first hybrid car running on both gasoline-electric dated back in 1901. Later BMW took the baton and developed its 5 series with a CVT hybrid technology. The car which gave Hybrid cars recognition amongst the masses was the Toyota Prius (1997). Presently Toyota is known as the lamp bearer of the hybrid car industry with are cord of 10 million hybrid car sale till 2015. Japanese manufacturer Honda has realise the importance of hybrid & with its Civic and Accord hybrid and its sale is 1.35 million (2015) strong.

MARKET SURVEY:



Bar graph of market survey

TECHNICAL CONCEPT:

As we can see in the survey every manufacturer is present in the market is interested in the hybrid segment. Hybrid is the future in vehicle development. As per the present day scene, hybrid cars are present the higher segment making it out of the reach for common man. Our idea is to make a economic hybrid car which will be highly efficient and will work according to driving condition.

Generally in countries like India where the vehicle is driven in a mix condition of traffic and highway a revolutionary series-parallel vehicle is needed. As we know internal combustion engines are highly efficient at highway drives but their efficiency drops down once they enter the city traffic. In our project we have designed a hybrid vehicle tailor made for

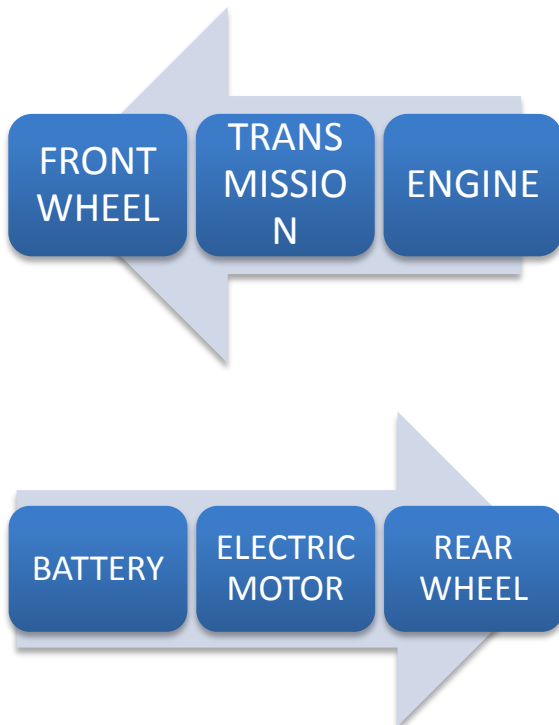
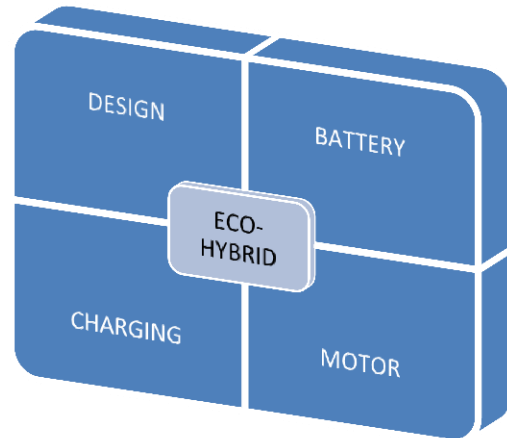
these conditions which a common man can afford.

Hybrid vehicles are expensive due to their highly complex design of integrating the electric motor and internal combustion engine, high cost of lithium polymer batteries and their different charging techniques.

Our model of multi-source eco-hybrid vehicle is simple yet effective. We have separated the complex integration part of engine and electric motor. The engine sits on the front of the vehicle while the motor is on the rear of the vehicle. In conventional hybrid vehicle the switching between engine to motor or vice versa is decided by the control unit which has to take feedback and work on an algorithm for smart switch. In our vehicle the switching modes will be done by the

driver, similar to the gear shifts driver can shift to electric mode when in traffic (up to 25kmph) and to engine mode when driving on the highways. This simple switching using a toggle switch eliminates the use of

controller and thus keeping the vehicle cost low.



DESIGN & WORK DONE:

- **ECO-HYBRID DESIGN:**

One of the reasons for higher cost of Hybrid Vehicles is the complex design technique and technology based design by computerised algorithm. To make the design simple and to cut down the cost the concept of electric hybrid was designed from ground up.

Keeping Indian driving condition of traffic and expressways in mind a switchable parallel hybrid electric vehicle was decided.

The vehicle will run in both I.C. and electric mode individually. Instead of compiling both the I.C. engine and electric vehicle in one axle i.e. only front wheel or rear wheel drive. The I.C. engine is kept in the front with the front wheel drive while at the rear the electric motor drives the rear wheel. These two drive modes are manually exclusive i.e. only one axle will be powered at a time while the other one will act as dead axle. This explains the basic chassis layout for drive pattern.



- **SELECTION OF THE DRIVE MODE:**

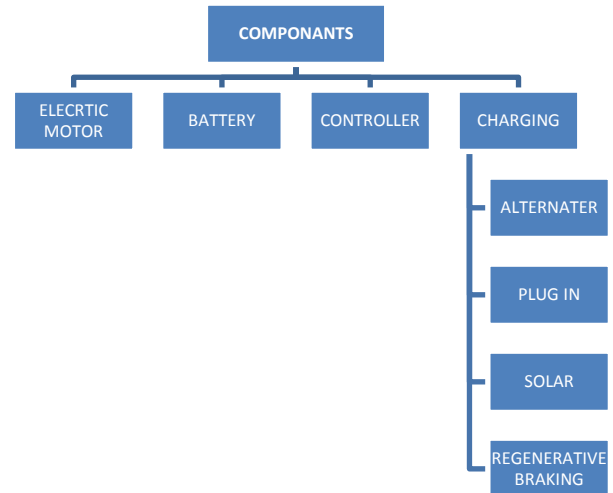
Hybrid Vehicle available in the market today uses highly complex and expensive mechatronics system. To cut down the cost and yet be efficient a deep thought had to be given over this section. Finally a manual trip tonic selection was decided.

So a manual switch will be provided to control over the selection of drive mode i.e. I.C. engine or electric motor.

A driver knows the driving condition better than any system. So its best to leave the selection of driving mode to him/her.

Here depending upon the driving condition like traffic, parking, highway, expressway a driver can change from electric to I.C. engine at a flick of a switch.

Driver can also take decision on the basis of fuel level, battery level, gradient, load on the vehicle etc. This manual switch will act as an ignition for both electric motor and I.C. engine.



ELECTRIC MOTOR:

Our hybrid vehicle will use DC motor running on the battery. A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.

DC motors are widely used, since they can be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. The universal motor can operate on direct current but is a



lightweight motor, larger DC motors are used in propulsion of electric vehicles.

CONTROLLER:

D.C motor controller periodically read the throttle position and adjust the current being supplied to the motor controller also:

- 1) Low voltage cut off
- 2) Over temperature cut off
- 3) Over current cut off
- 4) Brake cut off.

The controller take power from the battery and regulates it as per the input from the throttle. If the voltage falls below certain level due to low battery then the controller shuts down to protect the battery from further discharge.

Controller keeps the temperature of motor in check and shuts down the motor if required. To summarise a controller takes input from the driver and then regulates it as per requirement to the electric motor and hence to the driving wheels.

BATTERY:

To reduce the cost and to bring in economic factor in eco hybrid. It is decided to use lead acid battery to power the motor. Main reason being cost and ease of availability. To get the more voltage require for motor batteries are connected in series to boost the voltage. Required voltage is 48V and 50amp current. This can be achieved connecting four batteries in series of individual specification of 12V and 50Amp.

MULTISOURCE CHARGING:

- 1) Alternator
- 2) Plug in

- 3) Regenerative braking
- 4) Solar

The above methods were through after a lot of effort to keep the battery charge as much as possible to increase the range of the vehicle in electric mode. The charging process will be on even when the vehicle is running and also when it is stationary.

1)Alternator:-

Alternator is a part of vehicle which generates electricity from the running engine in order to charge the battery for starting the car, headlights, taillights, wiper, blower, horn etc. This same alternator is used to charge the battery for running the electric motor. When the electric motor is running on I.C. engine the alternator can be used to charge the battery.

2)Plug-In:-

Most common way to charge a pure electric vehicle is by plug-in charger. When the car is parked and the battery level is low then the regular electricity supplied at home (domestic supply) can be used to charge the battery. Plug-In circuit consists of regular step down transformer with a rectifier circuit to charge the D.C. voltage producing batteries. This charging method is based suitable for daily commuters who travel home to office (work place) and can charge their vehicle at either place.

3)Regenerative Braking:-



Very advanced yet simple technology of regenerative braking is used to charge the battery, when the vehicle is decelerating. When the vehicle in the process of stopping the energy generated in stopping is wasted in the form of heated brake pads and disc. A brushless D.C. motor has a inherent feature of regenerative braking where it can act as resistance to the moving vehicle and generate electricity at same time. This electric charge can be stored in the battery. Thus this free energy will charge the battery.

4)Solar:-

A car spends its most of its time on the road and outside environment, with adequate surface area of a car a lot of sunrays fall on it but not get utilized. Another way to charge the battery is by solar panel which will absorb the solar energy and can rest it to electric charge for battery, the unutilized roof panel can form an excellent place for solar panel which will charge the battery.

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CONCLUSION:

Multi source eco hybrid vehicle has been developed to minimise the present drawbacks in hybrid vehicle. Finally the cost has been radically brought down by careful and intellectual planning. With the simplicity in design and multiple charging facility every hurdle has been tried to be taken over.

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