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ALTERNATE ENERGY SOURCED VEHICLE-REVIEW STUDY

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Abstract— The main motto behind development of alternate energy source for vehicle is to provide the vehicle better fuel efficiency with no or bearable change in their power output. Vehicles powered by alternate energy source are also been referred as *hybrid vehicles*. Various types of hybrid technology exists from which we have selected is hybrid electric system which makes the use of a DC electric motor to alternately power our vehicle along with the IC engine. We seek to use the electric motor and IC engine alternately and in any possible combination. Also we can provide different driving modes of electric motor by controlling the voltage supplied to the motor.

Keywords—Hub motor, Conventional IC engine, Motor Controller, Battery, Efficient, Hybrid electric vehicle

I. INTRODUCTION

The automobile industry is growing rapidly and all the major players i.e. major automobile companies look in to develop more and more efficient vehicles without compromising their power output. This led to development of many alternate energy sources powering automobile. These types of vehicles are also referred to as hybrid vehicles. Basically hybrid drive system comprises of two or more than two power sources.

II. DIFFERENT TYPES OF ALTERNATE ENERGY SOURCE SYSTEMS

A. CNG Hybrid System:

In CNG hybrid system a vehicle running on IC engine is powered by gasoline and alternately by CNG (Compressed Natural Gas). The CNG system of any vehicle can be understood by referring below figure. It has a gas tank, a fuel filter, a high pressure fuel line to supply fuel to engine and shut off valve.

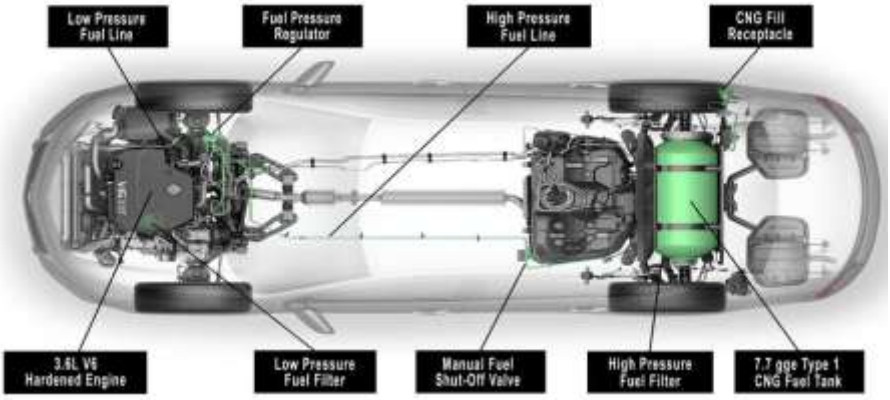


Fig. 1 Components of CNG hybrid system

B. LPG Hybrid System:

In LPG hybrid system a vehicle running on IC engine is powered by gasoline and alternately by LPG (Liquefied Petroleum Gas). The LPG is pumped in inlet manifold by LPG injector. The LPG readily vaporizes which cools surrounding air and its density increases. The cooled air improves the efficiency and performance of engine. The flow of LPG is controlled by ECU which works in tandem with car's own control unit to optimize injection time.

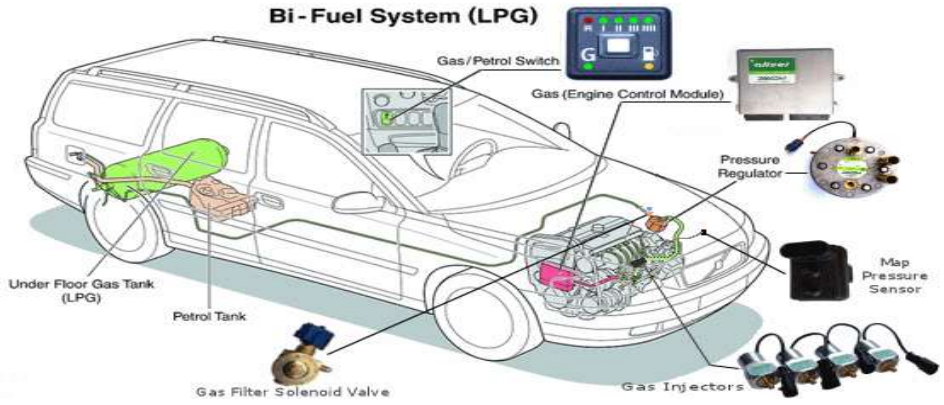


Fig. 2 Components of LPG hybrid system

C. Hydrogen Fuel Cell Hybrid System:

This type of hybrid vehicle has IC engine and its drive system and another source of power in the form of hydrogen fuel cell system. The hydrogen fuel system includes a hydrogen tank, a high output battery that stores power developed by regenerative braking system, stack of fuel cell which converts oxygen and hydrogen into electricity to power electric motor, an electric motor and a control unit which governs flow of electricity.

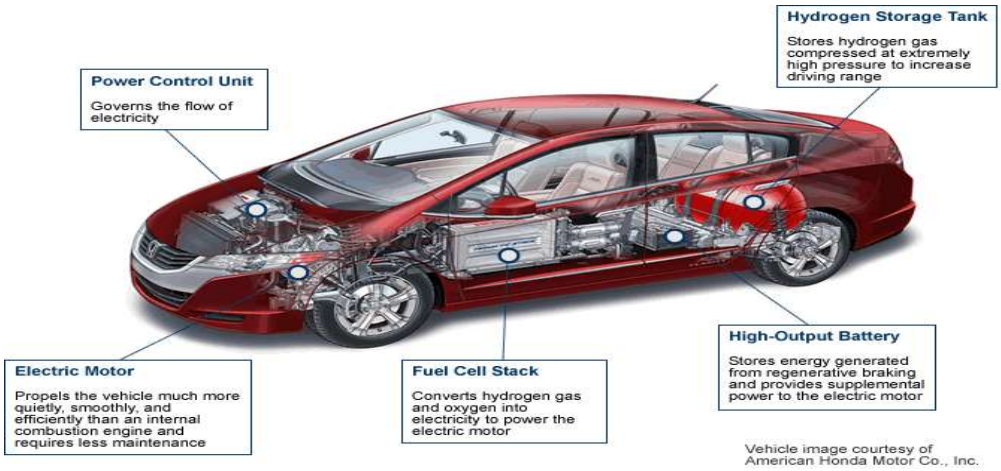


Fig. 3 various parts of hydrogen fuel system

D. Electric Hybrid System:

In this type of hybrid system, the required alternate power other than IC engine is provided by DC electric motor. It contains an electric motor, battery, generator and an electronic controller. It is the most efficient and has widespread application.

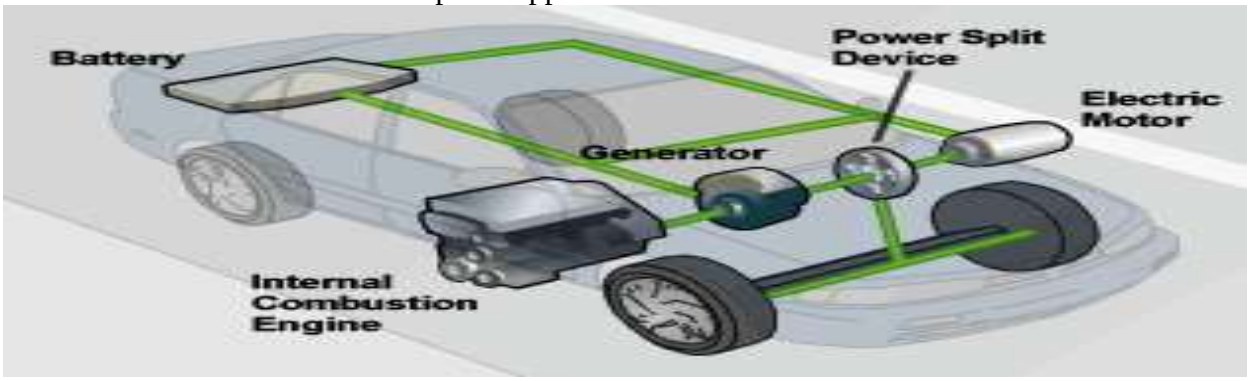


Fig. 4 various parts of electrical hybrid system

E. PURPOSE OF ELECTRIC HYBRID SYSTEM

- The purpose of hybrid electric cars is to couple a gas engine and an electric motor that assists the engine when accelerating. The batteries that power the electric motor are recharged automatically while driving.
- Therefore the main purpose of hybrid cars is to cut down usage of fossil fuels while maintaining excellent performance and saving money in the process as the government offers tax incentives to those who purchase a hybrid car in certain areas.
- For those who see the purpose of hybrid cars mainly from a reasonable point of view, there are a few factors to consider, including the cost of gas and the length of car ownership. The model of the car plays a significant role as well, especially its MPG rate.
- In their favor, hybrid cars have lower depreciation than standard gasoline cars. Besides, demand is likely to grow so if your purpose when purchasing a hybrid car is to make a financially wise investment, you probably are on the right track.

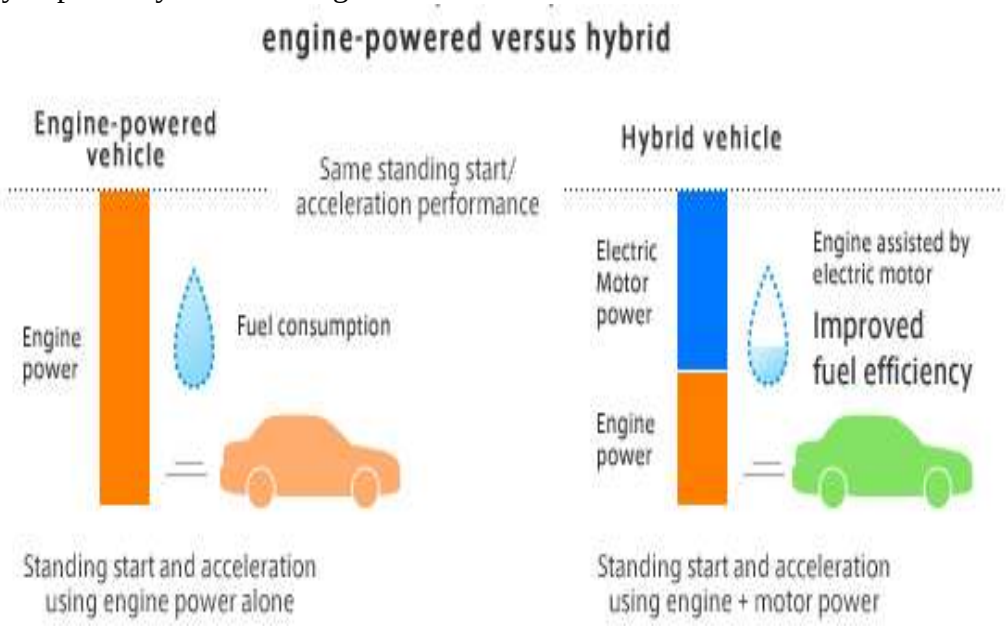


Fig. 5 Comparison of conventional and hybrid vehicle

III. LITERATURE REVIEW

1. "Energy efficient hybrid electric bike"

-by Aruneldho Elias, Geo Mathew

1.1. Summary:

- One of the major problem that we face on day to day life is definitely Energy Crisis. Our paper is one of the solutions for energy crisis.
- The system we implemented is a hybrid electric bike. This project has a numerous benefits to both the team members along with external benefits by increasing awareness of alternative locomotive.
- Despite of the environmental friendliness of our project or the project benefits for more people staying on non-polluting modes of transport, the main reason we selected this project was for the level of interaction between us and the engineers along with our product.
- Designing a transportation vehicle requires major consideration of mechanical objectives, electrical objectives, safety criteria, comfort, user friendliness as well as an array of other objectives which may conflict under various circumstances.
- We hoped that through navigating our way through this vast set of criteria the satisfaction of completing the project would be much greater than other projects we could have selected.

1.2 Conclusion

The hybrid bike would be powered by dual source such as gasoline and electricity.

Compared to ordinary bikes this hybridbike is more efficient and economic. This hybrid bike will be an innovation in automotive era, it is much more eco-friendly because it cause less pollution. The hybrid bike is a better solution for hiking fuel cost day to day.

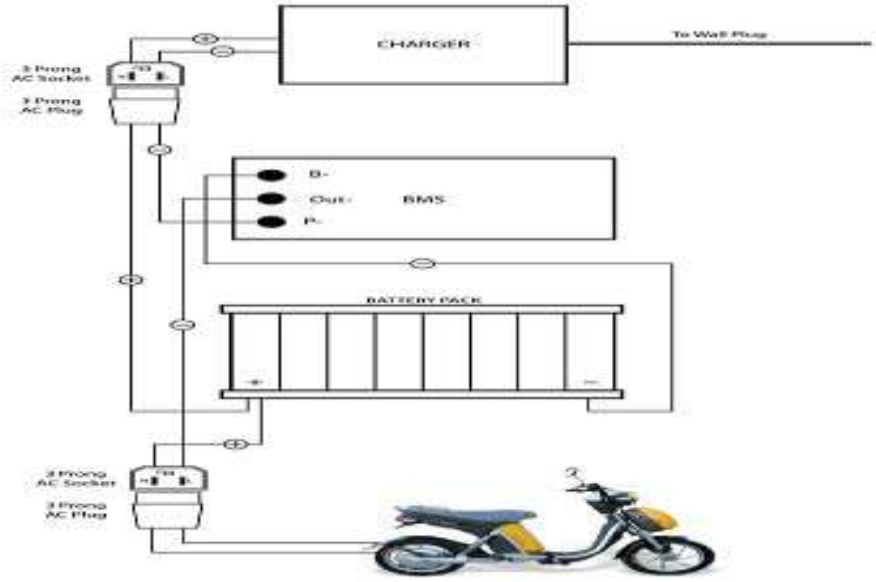


Fig. 6 Experimental layout of research

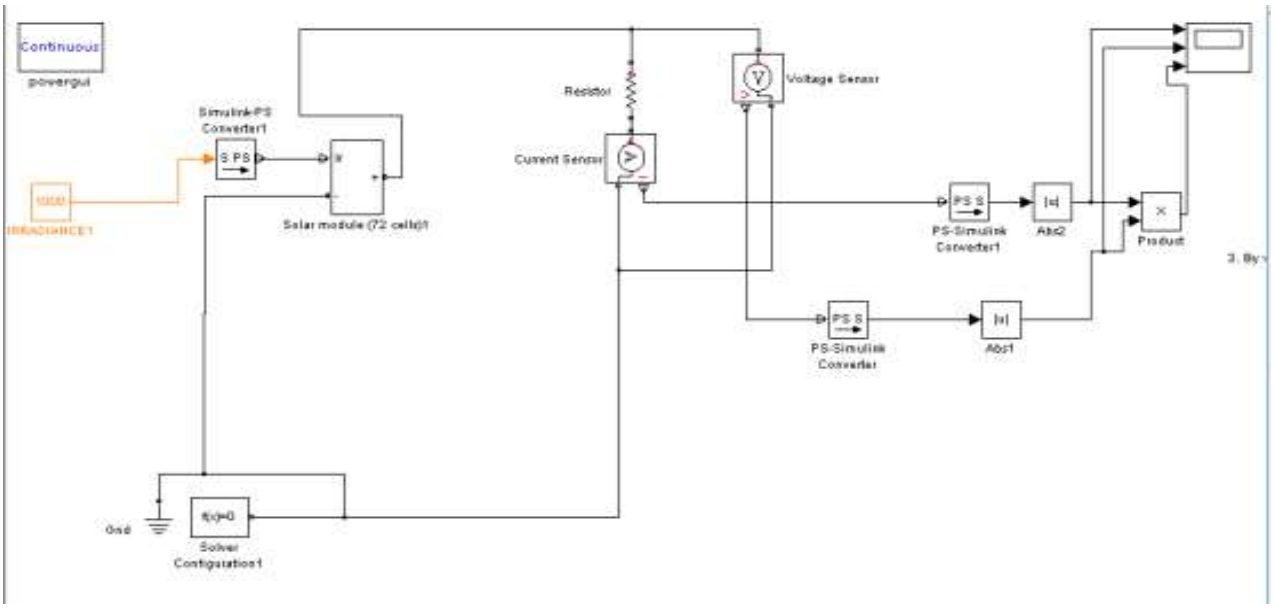
2. "Design and development of hybrid electric two wheeler"

-by Sharada Prasad N, Dr.K R. Nataraj

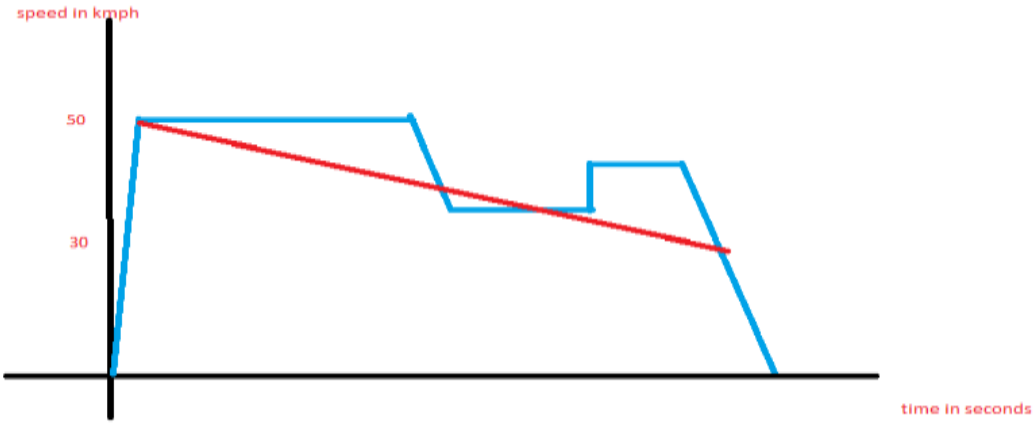
2.1 Summary:

The invention of internal combustion engine is one of the greatest inventions of mankind. The conventional vehicles associated ICE provide a good performance also long operating range. However they have caused and continue to cause serious problems for poor fuel economy, environment pollution and human life. Reducing fuel consumption and emissions is one of the most important goals of modern design. The hybridization of a convectional combustion engine vehicle with an advanced electric motor drive may greatly advance the overall efficiency and to grab higher fuel with reduced emissions. Considering the urban status in India, a well-organized and fuel efficient scooter has to be designed and developed.

Fig. 7 Prototype of research



For the test route we have chosen, the vehicle is in stock condition, capable for providing a mileage of 35km (as observed in stock driving), With this type of arrangement, can enhance the mileage performance efficiently by 25%. The throttle associated to ICE was moderately engaged in obtaining the propulsion during their test run. The throttle involved in driving the electric motor was mutually made involved with respect to ICE throttle. Both motor torque and ICE torque were responsible in proelling the vehicle during testing conditions. The torque distribution between ICE and electric motor has to be enhanced by designing a suitable torque synchronizer. The short battery life issue related to present electric bikes can be solved implementing this technology. Solar charging scheme which is designed for the proposed vehicle makes it more time efficient. Also less-emission, electric / ICE mode of operations can be further developed in this project



2.2 Conclusion:

It is observed that, the engine in this hybrid electric vehicle is utilized for obtaining the propulsion of the vehicle from the rest, as the speed is increased; the electric motor propulsion is combined with the ICE propulsion for total movement of the vehicle. The sum of torque obtained by both ICE and electric motor are organized for respective road gradient by adjustable suitably the respective controllers utilized. By doing torque distribution accordingly, battery life per total charge can be enhanced in driving the electric motor also minimizing the fuel required for ICE propulsion.

3. "Super capacitor/Battery hybrid powered electric bicycle"

- by Manoj E., Dino Isa, Rosalina Arelhi

3.1 Summary:

- This work executes a smart boost converter to implement an electric bicycle to be powered by a battery / super capacitor hybrid combination.
- A 36V, 250W front hub motor was reinstalled onto a normal geared bike powered by a 36V, 12Ah lithium ion phosphate battery pack.
- A 16.2V, 58F super capacitor module was connected in parallel to the battery pack via a custom made micro controller-based boost converter which arbitrates power between the battery and super capacitor.
- The controlled algorithm for the boost converter was invented using a practical approach by using various sensor inputs (battery/super capacitor current and voltage, bike speed) and comparing the control scheme.
- Based on the implementation of system experimental results show an improvisation in the up-hill acceleration of the bicycle
- As a result of the boost converter being responsive enough to harvest the extra current from the high power complementary super capacitor module avoiding deep discharges from the battery.

3.2 Conclusion:

Based on the developing system theoretical results shows an incremental change in the gradient acceleration of the bicycle as of the boost converter being attentive enough to manage the extra current from the high power complementary super capacitor module avoiding unnecessary discharges from the battery. This improves battery life.

The maximum speed of the vehicle remains untouched. The primary battery pack was guarded from high discharge currents which would gradually increase its life cycle.

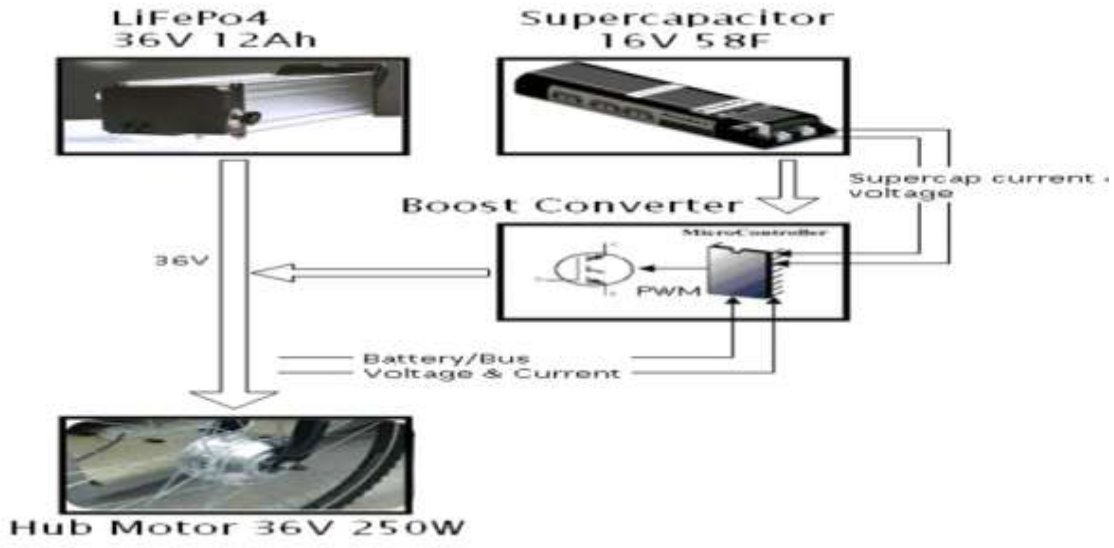


Fig. 8 working of hybrid electric vehicle

4. "Design with implementation of hybrid bike"

-by Pier Francesco, Roberto Mura, Sergio M.Savaresi

4.1 Summary:

This paper describes the process of planning, designing, and testing a hybrid electric bicycle.

The aim of this paper is to give details of modifying an existing mechanical system for individual that is based on both human propulsion as well as a set of electro-mechanical interfaces that provide assists.

After establishing criteria for speed, control, efficiency, and weight, we began a process of selecting parts and developing various models for how the overall system including the rider could be integrated in a way that is both safe, and easy to use.

The project has a number of benefits to both the team members as well as external benefits through increasing awareness of alternative transportation modes.

The goals of the project were to design and integrate an additional power transmission drive an existing mechanical bike.

Some additional goals or constraints to the project included the following: (1) limiting the costs of the system, (2) limiting the additional weight of the added drive and related components, (3) developing ease of operation of the bike whenever the electrical system is disengaged, (4) and integrating some of the various mechanical features of the original system with those of the hybrid system.

4.2 Conclusion:

We have designed an electric hybrid bike with a minimal amount of additional weight, an integrated control system, based on the decision-making of the rider and microcontroller, and that is capable of higher efficiency than typical hybrid bikes through its vast use of regenerative motor control and various other feedback for control mechanisms.

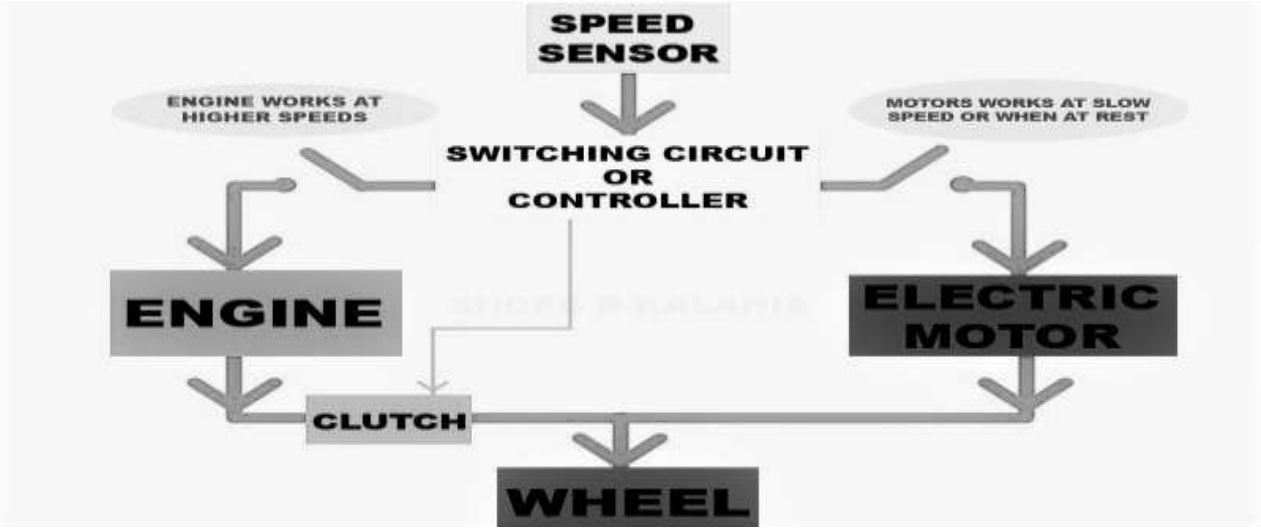


Fig.9 Block diagram and graphical representation

IV. CONCLUSION

After studying above mentioned literature reviews and thorough research it is observed that it is practically possible to implement the use of hybrid electric system in the existing conventional IC engine vehicles. It increases the overall efficiency of the vehicle; the vehicle consumes less amount of fuel and also it has two different power sources that can work independently resulting in long operating range of vehicles. The performance of hybrid electric vehicle depends upon wattage of motor used, type and specification of battery used. The range of vehicle can be increased by providing onboard battery charging system such as regenerative braking, providing generator, by the use of fuel cell, etc.

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