Design And Fabrication of Hybride Vehicle

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Abstract- *Since last 2-3 decades the average temperature of earth increased by 3-40C because of the green house effect. Due to increase in the fuel prices and continuously depletion of natural recourses for the fuels causes fuel crises in the modern society. Due to which demand of development of newly energy efficient vehicles increases. The hybrid technology fulfils this requirement by incorporating various combinations of bio-fuels and also by combinations of highly efficient electric drive systems. Along with the same it reduces the emission and cut the fuel cost. This project illustrates an implementation of hybrid technology on a small scale. Project aims at improving the mileage of the car using simple mild parallel hybrid technology with combination of electric motor drive and the petrol engine drive. We have used the straight open kart chassis design. The results show that alone a petrol engine gives best 25Km/lit, alone a electric motor gives 12kms on full battery charge. The combination of above two gives 40Kms.*

Keywords- Body frame, BLDC motor, micro Controller, Electric Switch, Battery.

I. INTRODUCTION

1.1. INTRODUCTION

Since the last two decades the judiciary and policymakers all over the world are deeply concerned about the urgent need for protection of the environment, ecology and humanity at large, there has been a steep rise in the accumulation of greenhouse gases particularly co2, which effect global changes in weather. Motor vehicle contribute about 14% of co2from all sources besides, pollution due to both petrol and diesel engine driven vehicles caused by the emission of co, no un burnt hydrocarbons, particulate and oxides of tetra ethyl, lead are injury to health and environment. Regulations on exhaust emission from vehicle engines have been made progressively more and more stipend towards the year 2000 and beyond. Vehicle manufactures have been hence obliged to meet these standards by designing cleaner and fuel efficiently engines and through provision for treatment of exhaust gases to satisfy the specified limits. So to satisfy and overcome these two problems namely

- Pollution
- Efficiency

Then we go for a hybrid vehicle in the name of HYBRID TWO WHEELER.

The invention of internal combustion engine is one of the greatest inventions of mankind. The conventional vehicles with ICE provide a good performance and 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 enhance the overall efficiency and achieve higher fuel with reduced emissions. Considering the urban status in India, a well organized and fuel efficient scooter has to be designed and developed.

1.2. HYBRID ELECTRIC VEHICLE AT A GLANCE

HEV are the vehicles with more than two energy sources are present. The major challenges for HE design are managing multiple energy source, highly dependent on driving cycles, battery sizing and battery management. HEV‟s take the advantages of electric drive to compensate the inherent weakness office, namely avoiding the idling for increasing the fuel efficiency and reduce emission during starting and speeding operations, to use regenerative braking instead of mechanical braking during deceleration and down slope driving.

HEV can meet customer’s need and has added value but cost is the major issue. These vehicles are of high cost and certain program should be supported by the specific government for marketing HEVs.

The HEVs are classified into two basic kinds-ies and parallel. Recently with introduction of me HEVs offering the features of both series and Allele hybrids, the classification has been extended three kinds- series, parallel and series-parallel. It interesting to note that some newly introduced HE not be classified into these three kinds. Here by classification involves series, parallel, series parallel complex hybrid.

1.3. Types of IC Engine

An internal combustion engine (ICE) is a heat engine where the combustion of a fuel occurs with an oxidizer (usually air) in a combustion chamber that is an integral part of the working fluid flow circuit. In an internal combustion engine the expansion of the high-temperature and a high-pressure gas produced by combustion applies direct force to some component of the engine. The force is applied typically to pistons, turbine blades, rotor or a nozzle. This force moves the component over a distance, transforming chemical energy into useful mechanical energy.

The first commercially successful internal combustion engine was created by Etienne Lenoir around 1859[1] and the first modern internal combustion engine was created in 1876 by Nikolaus Otto (see Otto engine).

The term internal combustion engine usually refers to an engine in which combustion is intermittent, such as the more familiar four-stroke and two-stroke piston engines, along with variants, such as the six-stroke piston engine and the Winkle rotary engine. A second class of internal combustion engines use continuous combustion: gas turbines, jet engines and most rocket engines, each of which are internal combustion engines on the same principle as previously described.[1][2] Firearms are also a form of internal combustion engine.[2]

In contrast, in external combustion engines, such as steam or Stirling engines, energy is delivered to a working fluid not consisting of, mixed with, or contaminated by combustion products. Working fluids can be air, hot water, pressurized water or even liquid sodium, heated in a boiler. ICEs are usually powered by energy-dense fuels such as gasoline or diesel, liquids derived from fossil fuels. While there are many stationary applications, most ICEs are used in mobile applications and are the dominant power supply for vehicles such as cars, aircraft, and boats.

Typically an ICE is fed with fossil fuels like natural gas or petroleum products such as gasoline, diesel fuel or fuel oil. There is a growing usage of renewable fuels like biodiesel for compression ignition engines and bio ethanol or methanol for spark ignition engines. Hydrogen is sometimes used, and can be obtained from either fossil fuels or renewable energy.

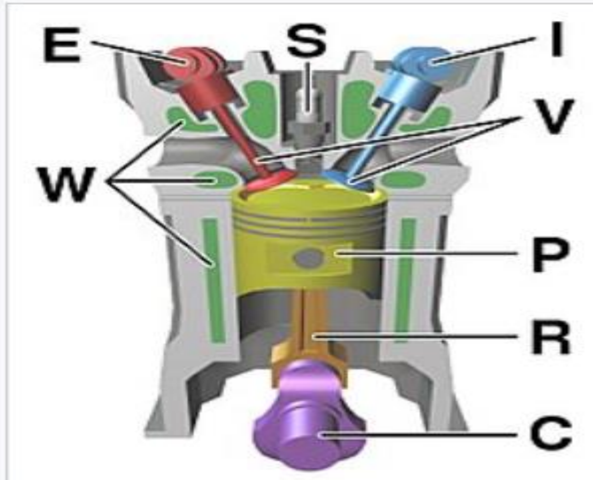


Diagram of a cylinder as found in 4-stroke gasoline engines.:
C – crankshaft.
E – exhaust camshaft.
I – inlet camshaft.
P – piston.
R – connecting rod.
S – spark plug.
V – valves. red: exhaust, blue: intake.
W – cooling water jacket.
gray structure – engine block.

A two-stroke (or two-cycle) engine is a type of internal combustion engine which completes a power cycle with two strokes (up and down movements) of the piston during only one crankshaft revolution. This is in contrast to a "four-stroke engine", which requires four strokes of the piston to complete a power cycle during two crankshaft revolutions. In a two-stroke engine, the end of the combustion stroke and the beginning of the compression stroke happen simultaneously, with the intake and exhaust (or scavenging) functions occurring at the same time.

Two-stroke engines often have a high power-to-weight ratio, power being available in a narrow range of rotational speeds called the "power band". Compared to four-stroke engines, two-stroke engines have a greatly reduced number of moving parts, and so can be more compact and significantly lighter.

1.4. Electric Vehicle

A plug-in electric vehicle (PEV) is any motor vehicle that can be recharged from an external source of electricity, such as wall sockets, and the electricity stored in the rechargeable battery packs drives or contributes to drive the wheels. PEV is a subset of electric vehicles that includes all-electric or battery electric vehicles (BEVs), plug-in hybrid vehicles (PHEVs), and electric vehicle conversions of hybrid electric vehicles and conventional internal combustion engine vehicles.[2][3][4] In China, plug-in electric vehicles are called new energy vehicles (NEVs).

Plug-in cars have several benefits compared to conventional internal combustion engine vehicles. They have lower operating and maintenance costs, and produce little or no local air pollution. They reduce dependence on petroleum and may reduce greenhouse gas emissions from the onboard source of power, depending on the fuel and technology used for electricity generation to charge the batteries. Plug-in hybrids capture most of these benefits when they are operating in all-electric mode. Despite their potential benefits, market penetration of plug-in electric vehicles has been slower than expected as adoption faces several hurdles and limitations. The global market share of the light-duty plug-in vehicle segment achieved 0.86% of total new car sales in 2016, up from 0.62% in 2015 and 0.38% in 2014.[5] However, the stock of plug-in electric cars represented just 0.15% of the 1.4 billion motor vehicles on the world's roads by the end of 2016.[6]

1.4.1. Plug-in electric vehicle

A plug-in electric vehicle (PEV) is any motor vehicle with rechargeable battery packs that can be charged from the electric grid, and the electricity stored on board drives or contributes to drive the wheels for propulsion.[2][3] Plug-in electric vehicles are also sometimes referred to as grid-enabled vehicles (GEV)[3] and also as electrically chargeable vehicles.[16]

PEV is a subcategory of electric vehicles that includes battery electric vehicles (BEVs), plug-in hybrid vehicles, (PHEVs), and electric vehicle conversions of hybrid electric vehicles and conventional internal combustion engine vehicles.[2][3] Even though conventional hybrid electric vehicles (HEVs) have a battery that is continually recharged with power from the internal combustion engine and regenerative braking, they cannot be recharged from an off-vehicle electric energy source, and therefore, they do not belong to the category of plug-in electric vehicles.[2][3]

"Plug-in electric drive vehicle" is the legal term used in U.S. federal legislation to designate the category of motor vehicles eligible for federal tax credits depending on battery size and their all-electric range.[17][18] In some European countries, particularly in France, "electrically chargeable vehicle" is the formal term used to designate the vehicles eligible for these incentives.[19] While the term "plug-in electric vehicle" most often refers to automobiles or "plug-in cars", there are several other types of plug-in electric vehicle, including scooters, motorcycles, neighbourhood electric vehicles or micro cars, city cars, vans, light trucks or light commercial vehicles, buses, trucks or lorries, and military vehicles

Comparison of full life cycle assessment(well-to-wheels) of carbon emissions and carbon footprint during production for four different powertrain technologies[40]

Type of vehicle (powertrain)	Estimated emissions in production (tonnes CO2e)	Estimated lifecycle emissions (tonnes CO2e)	Percentage of emissions during production
Standard gasoline vehicle	5.6	24	23%
Hybrid electric vehicle	6.5	21	31%
Plug-in hybrid electric vehicle	6.7	19	35%
Battery electric vehicle	8.8	19	46%

Notes: Estimates based upon a 2015 model vehicle assuming 150,000 km (93,000 mi) full life travel using 10% ethanol blend and 500g/kWh grid electricity.

II. CONCEPT AND METHODOLOGY

The concept of project is to increase efficiency and decrease pollution with the help of hybrid engine petrol cum electric by replacing the front wheel with DC motor fitted in it. It will be running with the help of12 voltage and 30 AMP 4 series batteries in series connection.

We have design this concept to overcome with the problems of existing vehicle. While existing vehicle are polluting the atmosphere and having less efficiency.

The second thing we notice that the fuel price are increasing day by day and electric bikes are too costly so we have decided to prefabricate the existing vehicle while replacing the front wheel with the BLDC motor fitted inside the wheel which is control by micro controller and powered by series battery.

Now after replacing the wheel the vehicle will be called as hybrid vehicle (petrol cum electric) after this the vehicle efficiency will increase and pollution will also decrease.

III. DESIGN AND IMPLIMENTATION

3.1. Components taken

Based on the literature survey and availability, we have listed the required components of the hybrid vehicle.

1. Battery (Power supply unit)
2. Speed controller
3. Brushless DC Hub Motor
4. Battery Charging Kit
5. Bajaj spirit

Engine & Transmission	Technical Specifications	Spirit – Advantage
Engine Type	2-Stroke. Forced air cooled	All aluminiumengines. Reliable and superior in performance
Engine Displacement	59.9cc	
Max Net Power	3.6Hp at 6500 rpm	Can carry two with ease.
Transmission Type	Oil-immersed 2-speed	Consistent performance and fuel efficiency. Lower maintenance.
Grade ability	15%	Takes on steep terrain with ease.
Chassis		
Frame Type	Tubular	Strong durable frame.
Suspension-Front	Leading link with co-axial hydraulic dampers, coil springs and anti-dive link	Coasts along comfortably even on rough roads.
Suspension-Rear	Hydraulic damper with co-axial springs	
Tyres-Front and Back	2.75 X 10	Better road grip.
Electricals		
System	12V, AC + DC	Powerful electrical for safe riding.
Head Lamp	35/35W	Night piercing headlamp for safe riding.
Electric Start	Options available	Life gets easier.
Dimensions		
Length x Width x Height	1685mm x 635mm x 1020mm	Lower height for absolute ease of riding.
Wheelbase	1165mm	Better manoeuvrability
Ground Clearance	120mm	Rides through rough roads with ease.
Kerb Weight	72Kg	Light and easy to handle.
Min Turning Radius	1.75m	Easy manoeuvrability helps you weave in and out of city traffic.

Hub Motor Calculation

Motor specification

Rpm = 1000

Volt = 48 V

Power = 500 W

Power equation

Power = I * V

Where

V = 48 V

P = 500 W

I = 500/48

= 10.41 A

To find torque of the motor

T = P*60 / 2*3.14*N

= 500*60 / 2*3.14*1000

= 4.77 N-m

Torque of the wheel hub motor, T= 4.77 N-m

Power Required to Propel the Vehicle

Weight = 72+(70*2)

=212 Kgf

Total resistance = Rolling resistance + Air resistance+ Gradient resistance

$$R= K_r W+K_a AV^2+W\sin\theta$$

$$R=(0.018*212)+(.0028*30^2*.635*.9)$$

R=5.256 Kgf

R=51.56 N

Power= (51.56*8.33)/.9

P=477.417

Hence, the power required to propel the vehicle is477.417 W, which is just below our motor specification 500 W. And the design is safe.

Battery Calculation

To find the current

Watt = 18 W

Volt = 12 V

P = V * I

18 = 12 * I

I = 18/12

= 1.5 Amps

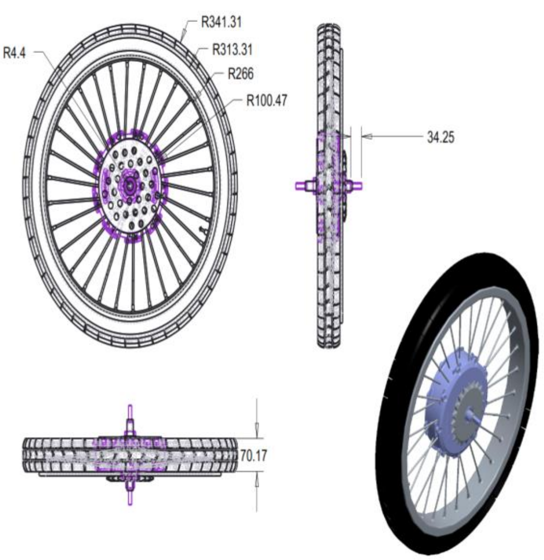
BATTERY USAGE WITH 1.5 AMPS

= BAH / I

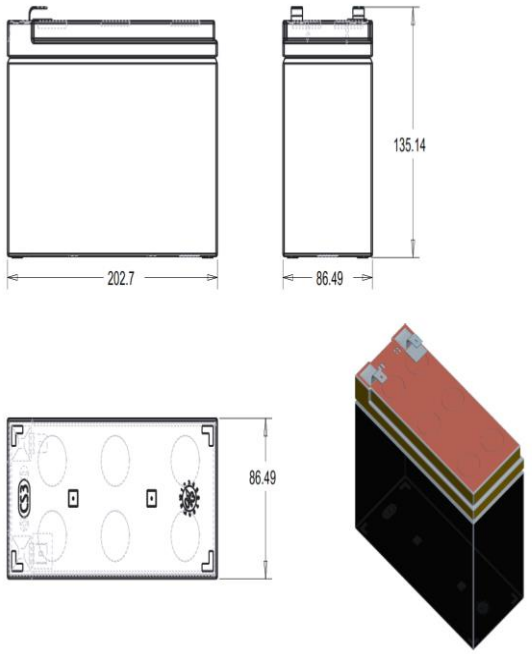
= 8/1.5

= 5.3 hrs

Front Wheel



Battery



Electric switch to transfer the mode from petrol to electric

Electric motor in wheel drive

Batteries

Fabrication of Hybrid Vehicle

IV. CONCLUSION

It is observed that, the ICE in this built 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 total torque obtained by both ICE and electric motor are synchronized for respective road gradient by varying 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. For the test route chosen, the vehicle in stock condition, eligible for giving a mileage of35km (as observed in stock driving), With this type of arrangement, can enhance the mileage performance efficiently by 25%. The throttle with respect to ICE was moderately involved in obtaining the propulsion during the 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 propelling the vehicle during the test run. 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 low-emission, electric / ICE mode of operations can be further enhanced in this project.

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