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FABRICATION AND PERFORMANCE ANALYSIS OF HYBRID TWO WHEELER

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Abstract: *This work deals with design and fabrication of hybrid two wheeler system. In reason days availability of fuel source is depleting day by day and also pollution is increasing globally with increase number of vehicle. This leads to the evolution of various alternative fuels and concepts, in that HEV system (hybrid electric vehicle) is one of the effective systems. This project involves the fabrication of two wheeler (HEV) which is driven by both fuel and electric energy with the help of engine and electric motor. The electric motor is the hub motor which drives the front wheel which is driven by the battery and the engine drives the rear wheel. By driving the fabricated two wheeler in engine mode, electric mode and hybrid mode, the performance of the bike is tested and analyzed by comparing with the conventional bikes. This vehicle hugely reduces the pollution, fuel consumption and vital scope in future.*

Keyword: hybrid two wheeler, smart hybrid, hub motor, HEV, pmdc motor etc.

1. INTRODUCTION

In the modern developing world, everything that we utilize are becoming more and more advanced in sort of every single step forward. As technology giving birth to the new innovation, automation and modification ideas for existing system. Most importantly in case of automobile sector. Automobiles plays important role in the human need as its use is increasing day by day. It has many essential uses but it also creates the major disadvantages in our world. Issues like pollution, fuel, efficiency make them unlikable. Researches are going, to solve these issues to make it smoother to our lives. In spite of recent efforts to improve fuel effectiveness and decrease poisonous emissions in cars, emissions have proceeded to increment consistently in the past two decades. For conservation of gasoline for future and expanding the effectiveness of vehicle an electric vehicle can be a major breakthrough. A hybrid vehicle tackles these issues by combining the advantages of both the frameworks and uses both the control sources at their efficient conditions. The objective of this project points at way better utilization of fuel energy and decreases Dependence on non-renewable assets utilizing most recent innovation. The execution includes improvement of HEV that uses battery as well as gasoline control for drive of vehicle. It also has vital future scope in the field of automobiles as it has various benefits.

1.1 Concept of HEV:

A 'gasoline-electric hybrid vehicle' is a vehicle which depends not as it were on gasoline but too on electric control source. In HEV, the battery alone gives control for low-speed driving conditions. Amid long highways or slope climbing, the gasoline motor drives the vehicle. Hybrid electric vehicles contain of an electric engine, inverter, battery as electric drive and an inside combustion engine with transmission associated as gasoline based drive. It is to accomplish way better fuel economy and reduce poisonous emissions.

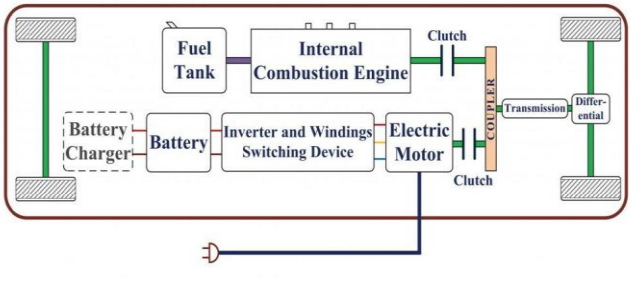


Fig 1- Concept of HEV

2. PROBLEM IDENTIFICATION:

1) increasing in motorcycles in india

2) Cons of petrol bikes

1. Foreign Affairs and Rising Prices
2. Economics
3. Climate Change
4. Polluting Natural Resources

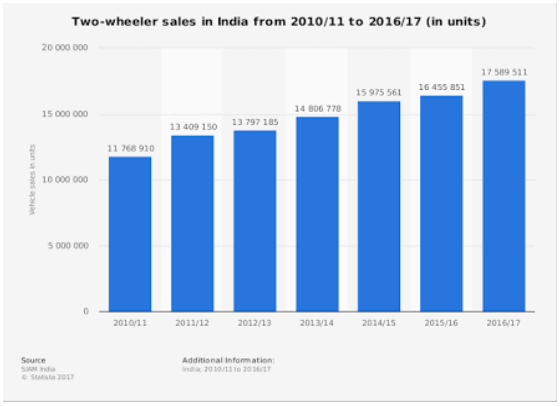


Chart 1-increase in no of vehicles

3) Global warming

1. Greenhouse gases and its effect

4) Emissions

1. NOx emission
2. Unburnt HC emission
3. Co emission

5) Cons of electric vehicles

1. Lack of Charging Stations
2. Expensive
3. Lack of Power and Reduced range
4. Minimal Amount of Pollution
5. Other power loss during engine operation

Thus HEV has the various benefits to overcome the cons of petrol vehicles and electric vehicles and it also has efficient future scope in this developing world.

3. LAYOUT OF OUR WORK

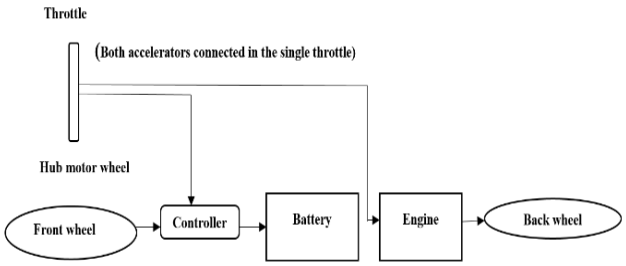


Fig 2- layout of the concept

4. MODELLING

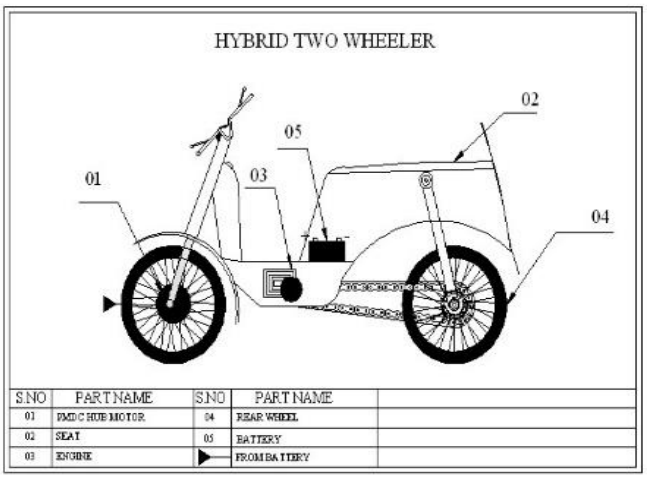


Fig 3-CAD model

5. COMPONENTS

5.1 TVS scooty es

Fig 4-bike

This is a 60cc fuel bike which we adopted to make dual power bike (fuel cum battery bike), it can carry up to 250 kg load. This is full working bike. The fuel capacity of the bike is 5 litres. The top speed of the bike is 74 kmph. There is a speedo meter and fuel level indicator at the handle. Accelerator at right side of the handle and there is brake levers and the front brake at left side of the handle and back brake at right of the handle and there is working head lamp and tale land and both side indicators are perfectly in working condition

5.2 Hub motor setup

- **PMDC hub motor**
- **Controller**
- **Throttle**

Fig 5-hub motor kit

Hub motors are a curiously improvement which could offer benefits such as compactness, silent operation and high productivity for electric vehicles. These motors have stators fixed at the axle, with the permanent magnet rotor embedded in the wheel. Electric motors have their most prominent torque at start-up, making them perfect for vehicles as they require the most torque at start-up as well. Permanent Magnet DC motors are valuable in a run of applications, from battery fuelled gadgets like wheelchairs and control devices, to transports and entryway openers, welding equipment, X-ray and tomographic setups, and pumping hardware, to title a few. They are as often as possible the most excellent arrangement to movement control and power transmission applications where compact measure, wide working Speed extend, capacity to adjust to a run of control sources or the security contemplations of low

voltage are imperative. Their capacity to create tall torque at low speed make them reasonable substitutes for adapt engines in numerous applications. Since of their straight speed-torque bend, they particularly suit adaptable speed and servo control applications where the motor will work at lower than 5000 rpm. Inside these motors, changeless magnets fortified to a flux-return ring supplant the stator field windings found in shunt engines. A wound armature and mechanical brush commutation setup total the motor. The permanent magnets supply the encompassing field flux, disposing of the require for outside field current. This plan yields a littler, lighter, and vitality productive motor.

5.3 Battery

Fig 6-lead acid battery

Battery is use for storing the energy produced from the dynamo. The battery used is a lead-acid type and has a capacity of 12v; 2.5A.the most inexpensive secondary cell is the lead acid cell and is widely used for commercial purposes. A lead acid cell when ready for use contains two plates immersed in a dilute sulphuric acid (H2SO4) of specific gravity about 1.28.the positive plate (anode) is of Lead –peroxide (PbO2) which has chocolate brown colour and the negative plate (cathode) is leading (Pb) which is of grey colour. When the cell supplies current to a system (discharging), the chemical activity that creates lead sulphate (PbSO4) on both the plates with water being created in the electrolyte. After a certain amount of energy has been withdrawn from the cell, both plates are transformed into the same material and the specific gravity of the electrolyte (H_2so_4) is lowered. The cell is then said to be discharged.

6. CALCULATION

6.1 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

I= 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= KrW+KaAV2+Wsinθ

R= (0.018*212) + (.0028*302*.635*.9)

R=5.256 Kgf

R=51.56 N

Power,

P= (51.56*8.33)/.9

P=477.417 W

Hence, the power required to propel the vehicle is 477.417 W, which is just below our motor specification 500 W. And the design is safe.

6.2 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

7. FABRICATION

7.1 Fixing hub motor to the front wheel

Fig 7-hub motor fixed in front wheel

In this figure we can assembled a hub motor in at the front wheel and it is clamped to the body frame with the support of iron flat rods, nut and bolts. The suspensions were connected to the wheel shaft and body frame to avoid the up and down of the road.

7.2 Fixing battery under the seat

In this figure we can see the both the fuel engine and battery coil which is perfectly assembled and clamped to the bike and fuel engine is perfectly aligned straight to back wheel.

Fig 8-battery placed under the seat

The coil of the batteries perfectly engine mountain at the top of the rear wheel body frame which help us to rotate back wheel with the help four 12volts battery to rotate the front wheel with the support of battery charging.

7.3 Fixing the controller

Controller consists of speed controller, in order to control speed of e-bike. It is used to control the power supply given to hub motor and gives the consistent power to the hub motor. Throttle is connected to the controller for controlling the speed of the vehicle

Fig 9-hub motor controller fixed in the front

7.4 Fixing two accelerators in one throttle

The both throttles are fixed at the right of the handle bar and it can be connected using clamp.

Fig 10-two accelerators connected in single throttle

8. WORKING MODEL

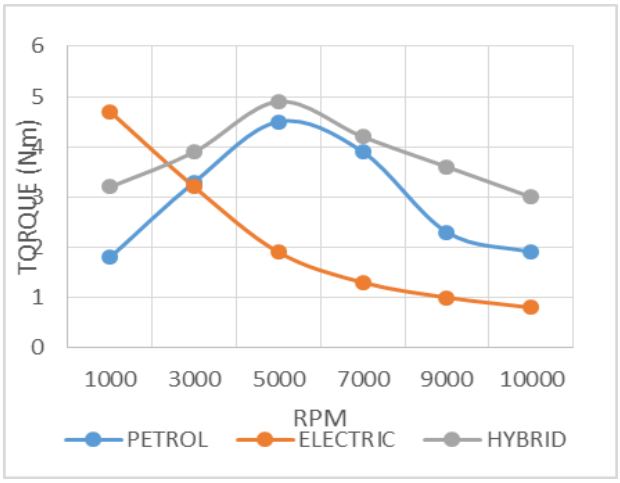
Fig 11, 12, 13- working model

9. RESULT AND DISCUSSION

S.NO	Content	Petrol	Electric	Hybrid
1	Source	Ic engine	Battery	Dual
2	Drive	Engine	Hub motor	Dual
3	Maximum speed	55	45	45-50
4	Maximum torque	4.5nm	4.77nm	4.9nm
5	Mileage	50-55 km	45-50 km	95km(appx)
6	Emission	Yes	No	Very low
7	Pulling in up hills	Fair	Poor	Good

Table 1- performance table

9.1 Torque graph



Graph 1-torque

10. CONCLUSION

HEV is a vehicle that uses two sources of power- gasoline and battery. For low power application battery drive is used whereas for high power application where power requirement is very high gasoline engine is used. Gasoline drive is most proficient at high speed drive. Hence HEV‟s both mode of operation happens at their most extreme productivity. But in gasoline engine low speed operation is not efficient. Its high speed mode is only efficient. Therefore, it gives twice the mileage given by a normal vehicle. As this vehicle transmits 50% less pollutants than typical vehicle it plays a vital part for decreasing contamination to certain degree without compromising with proficiency.

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