

Modified Bike With Double Mileage By Hybrid Technique

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Abstract: The invention of internal combustion engine is one of the greatest inventions of humankind. The conventional vehicles with internal combustion engine 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. Reduction in fuel consumption and emissions is one of the most important goals of modern design. The hybridization of a conventional 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.

Key words – HEV, Hybrid two wheeler, Hub motor.

A. INTRODUCTION

A hybrid vehicle is with multiple distinct energy sources which could be separately or simultaneously operated to propel the vehicle. Many hybridization systems configurations such as fuel cell, gas turbine, solar, hydraulic, pneumatic, ethanol, electric and many more are proposed over the years. The hybrid electric vehicles, integrating two well established technologies of electric motors and internal combustion (IC) engine, allowing drawing upon their individual benefits have been widely accepted by the users. The most commonly adapted hybrid vehicle which combines two sources of an electric motor and an I.C. engine. The power supply to the electric motor comes from on board batteries.

The objective is to design and fabricate a two wheeler hybrid electric vehicle powered by both battery and IC engine. The combination of two sources of the power makes the vehicle dynamic in nature. In HEV, the battery alone provides power for low-speed driving conditions where internal combustion engines are least efficient. In accelerating, long highways, or hilly areas climbing the electric motor provides additional power to help the engine. Besides it also utilizes the concept of regenerative braking for optimized utilization of energy.

B. COMPONENTS SELECTION

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

Batteries

- i. DC controller
- ii. BLDC hub motor
- iii. Battery charging kit
- iv. Arduino board IC328
- v. Hero pleasure

C. WORKING PRINCIPLE

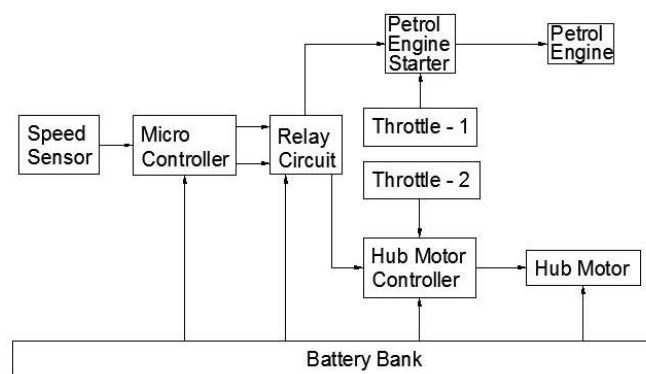


Fig1: Block diagram of modified hybrid technique

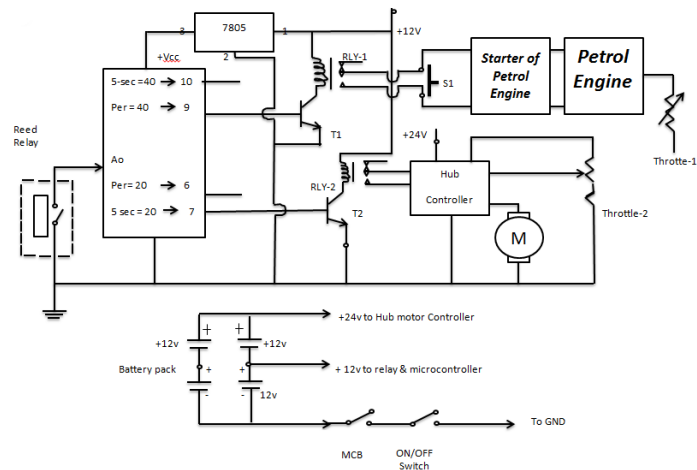


Fig2: Circuit diagram

The working principle of hybrid vehicle basically involves three processes, the first process involves when the vehicle is running by means of BLDC hub motor, second process involves when the vehicle is running by means of both mode according to requirement and the third process involves when the vehicle is running by means of internal combustion engine requirements. When the vehicle is driven at the outside of the city and need more power to drive, the vehicle is powered by means of internal combustion engine. The power from the engine is taken from pulley and then it rotates the wheel.

1. ELECTRIC MODE (1 TO 20KMPH)

Here we are using the BLDC hub motor which is running with help of battery power. This mode is operated from speed 0 to 20kmph and the position of switch at S1. Here the IC engine is at ideal position. Power supplied to the bike only by BLDC motor. The speed of bike running in electric mode is less than IC engine mode. This mode reduces the expenditure on fuels as well as pollution. For electric mode indication we used green LED in dashboard.

2. HYBRID MODE (21 TO 40KMPH)

In this mode we made the special arrangement, both throttle coupled to each other. Hybrid mode is a special type of mode where rider does not care about the current mode of operation. This is fully controlled by microcontroller. In this mode switch will be at S2 position. Microcontroller is programmed, as when the vehicle is running in speed between 21 to 40kmph hybrid mode will be activated. In this mode rear wheel take power from IC engine, at the same time front wheel (hub motor) take power from batteries.

3. PETROL MODE (> 40KMPH)

The third process involves when the vehicle is running in both the modes according to the requirements. The petrol mode of the vehicle is dependent only on the IC engine. The throttle 1 is connected to S3 position. In this mode the BLDC motor will be in ideal position at the front wheel, where its battery connections are cut off by another relay which again controlled by microcontroller.

D. COMPONENTS

1. HUB MOTOR

Hub motor is also called wheel motor, wheel hub drive and also in-wheel motor. In BLDC hub motor the mechanical commutation is replaced with electronic commutation. Hub motors are an interesting development which could offer benefits such as compactness, noiseless operation and high efficiency for electric vehicles. These motors have stators fixed at the axle, with the permanent magnet rotor embedded in the wheel. There is a radial air gap between the stator and rotor. The stator consists of stacked laminated steel plates with wound coils. Pulse width modulated current is used to supply current to the stator.

2. DC Controller

The controller connects the power source to the motor. The speed controller of an electric bike is an electronic circuit that not only controls the speed of an electric motor, direction of rotation but also optimizes energy conversion. This controller unit uses power from the battery pack and drives it to the hub motor. The BLDC motor speed controller sends signals to the motor hub in various voltages. These signals detect the direction of a rotor relative to the starter coil.

3. ACCELERATOR

The accelerator mode is similar to how a motorcycle or scooter operate. When the accelerator is engaged the motor provides power and propels you and the bike forward. It allows you to kick back and enjoy a free ride. Most accelerators can be fine-tuned like a volume dial between low and full power.

E. RESULTS AND COMPARISONS

- The motor and the engine average efficiencies of the vehicle were tested individually and were compared with their corresponding maximum efficiencies.
- An Energy Management system was developed successfully which can make decisions based on speed to obtain maximum mileage and reduce fuel emissions.
- The CO₂ emission in an IC engine is the maximum in the speed range of 0kmph-20kmph, as the motor is being used in this range, the emissions are negligible.
- The emissions are least in the speed range of 20-40kmph, and the vehicle majorly runs in this range, hence It significantly decreases the emissions.

Whole assembly of all components of vehicle was tested with all modes of operation and the following results were obtained which tabulated as follow.

Category	IC Engine	Electric	Hybrid
Fuel cost 1 Litre (Rupees)	80	8	88
Mileage per 1 Litre	40	50	90
Running cost of the vehicle per Km	2	0.16	0.98
Speed of the Vehicle	55	35	45

F. CONCLUSION

Hybrid vehicles are definitely more ecofriendly than internal-combustion vehicles. Batteries are being implemented to have a long life. When the hybrid vehicle becomes more widespread, battery recycling will become economically possible. Research into other energy sources such as fuel cells and renewable fuels make the future look brighter for hybrid vehicles.

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