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Hybrid Bike Manufacturing and Testing

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Abstract - *Fuel costs are increasing tremendously now a days; petrol almost Rs.100 per liter and diesel about 90 Rs. per liter. So common man need an alternate solution for fossil fuels driven transportation options. Electric vehicles are good solution but not better due to its high initial cost of vehicle than conventional vehicles. In the modern trend automobiles have certain disadvantages soon as fuel cost relative to mileage, pollution and less efficiency. The aim of this project is to manufacture an efficient and low pollution vehicle. In our project the hybrid electric vehicle model have the internal combustion engine of a conventional vehicle with the battery and electric motor of an electric vehicle, resulting in double the fuel economy of conventional bike. We are implementing this hybrid electric vehicle system for two wheeler.*

***Key Words*: Hybrid vehicle, Manufacturing, Internal combustion engine, Electric motor and Battery.**

1. INTRODUCTION

Energy crisis is one of the major concerns in today's world due to fast depleting resources of petrol, diesel and natural gas. In combination with this, environmental decay is an additional factor which is contributing to the depletion of resources which is an alarming notification. Our paper proposes the solution for this above perilous problems. The system which we innovated is the Electric Bike. This project has various benefits both to the members of the team and also external benefits thereby making awareness of using alternative modes of transport. The Electric Bike which works on the battery that is powered by the motor is the general mode of transport for a local trip. The solar panels can be alternative source for this by adding it to the system. The Electric bike which will be running on battery, the power is supplied by the motor, thereby supplying this power to drive the other gear components. The main purpose of using this E-bike is that it is user friendly, economical and relatively cheap. The efficiency of this system undeniable compared to conventional modes of transport.

The following table shows the specification of various electric bikes used in few countries. 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 co2 from 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.

2. COMPONENTS

1. Battery
2. Controller
3. Hub Motor
4. Battery Charger
5. bike

3. CALCULATIONS

Volt = 36 V
Power = 250 W

3.1Power equation

Power = $I * V$
Where

V	=	36 V
P	=	250 W
I	=	250/36
	=	6.94 A

3.2 To find torque of the motor

T = P*60 / 2*3.14*N
= 250*60 / 2*3.14*1000
= 2.38 N-m
Torque of the wheel hub motor, T= 2.38N-m

3.3 Power Required to Propel the Vehicle

Weight = 72+(70*2) =212 Kgf

Total resistance = Rolling resistance + Air resistance + Gradient resistance
$R=K_rW+K_aAV^2+W\sin\theta$ R=(0.018*212)+(.0028*30²*.635*.9)

R = 51.56N
Power = (51.56*8.33)/0.9
= 2277.417

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.

3.4 Hub Motor Calculation

Motor specification
Rpm = 1000
Battery Usage
B_{AH} / I
14/6.94 = 2 hrs

4. WORKING PRINCIPLE

The working principle of HYBRID BIKE basically involves three processes, the first process involves when the vehicle is running by means of internal combustion engine, second process involves when the vehicle is running by means of an electric motor and the third process involves when the vehicle is running in both the modes according to the 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.

4.1 Petrol Mode

In petrol mode, engine will supply power to the rear wheel. When the switch is moved to this position (S1), the microcontroller will sense the position of the switch and transmits signal to the relay, which will energize the ignition coil and operate the starter motor. The rider can control the speed by means of ordinary accelerator handle. 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 thee micro controller. This mode can be activated when we require high power outside the city limits. During this high power operation engine will run on its own rated rpm, so the fuel consumption are considerably low, also the pollutants coming out of the exhaust is reduced.

Fig. 1: M 80

Fig.: 2 Battery

Fig.: 3 Motor

4.2Electric Mode

Here we are using the BLDC hub motor which is running with help of battery power. Battery is placed in the goods space under the seat. The motor are fixed on the front wheel of the vehicle and it is controlled through the controlled unit. The hub motor is steadily emerging as a standard drive method just like e-bikes, scooters, solar cars, and many other light electric vehicles. With a hub motor conversion, there is no need for external mounting brackets and drive chains to support a motor and transmission. The direct drive hub motor is about as simple as things get. The motor are exactly fixed as in center axis of the wheel hub. Now the vehicle rim starts to spin over the axis body for rotation of wheel. The electric power supply is charged to the battery through the separate charger. Here some losses may be occurred due to mechanical friction. Here we are also having the fuel drive which is coupled with the back wheel of the vehicle. When the vehicle is driven inside the city, running in the plain and need of low power the vehicle is powered by means of a motor. The power to run the motor is supplied from the battery. During this process The speed of the vehicle will be minimum and there is no smog forming pollutants produced during the vehicle runs. The mileage of the vehicle while

running on the electric motor is mainly depends upon the time of charging and also depends upon the capacity of the battery.

4.3Hybrid Mode

This is a special type of mode where rider does not care about the current mode of operation. This is entirely controlled by microcontroller. In this mode switch will be in S3 position. Microcontroller is programmed as when the vehicle is running in 30kmph or less than that, electric mode will be activated. If it is above 30kmph, then petrol mode is to be operated. To sense the speed of the vehicle, we are going to take speedometer readings as input. At city limits the vehicle operates in electric mode and in outer it will operate in petrol mode. Therefore we can reduce the energy consumption, pollution, rupees per km.

5. ANALYSIS OF VEHICLE COMPARISON

Table: 1 Comparison and Result

Type	IC Engine	Electric	Hybrid
Vehicle Cost	50000	50000	30000
Fuel cost/ ltr	100	8	8
Mileage/Ltr	45	60	60
Running cost/ km	2.2	0.16	0.16
Speed	80	35	35

6. CONCLUSION

With the increasing consumption of natural resources of petrol, diesel it is necessary to shift our way towards alternate resources like the Electric bike and others because it is necessary to identify new way of transport. Electric bike is a modification of the existing bike by using electric energy and also solar energy if solar panels are provided, that would sum up to increase in energy production. Since it is energy efficient, electric bike is cheaper and affordable to anyone. It can be used for shorter distances by people of any age. It can be contrived throughout the year. The most vital feature of the electric bike is that it does not consume fossil fuels thereby saving crores of foreign currencies. The second most important feature is it is pollution free, eco – friendly and noiseless in operation. For offsetting environmental pollution using of on – board Electric Bike is the most viable solution. It can be charged with the help of AC adapter if there is an emergency. The Operating cost per/km is very less and with the help of solar panel it can lessen up more. Since it has fewer components it can be easily dismantled to small components, thus requiring less maintenance.

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