

Fabrication of Dual Powered Vehicle

Dr.P.Ramesh Babu

Professor,

Department of Mechanical Engineering,
VITS College of Engineering,
Sontyam, Anandapuram, Vizag.

Mr.M.Anil Kumar

Student,

Department of Mechanical Engineering,
VITS College of Engineering,
Sontyam, Anandapuram, Vizag.

Mr.D.Pratap Varma

Student,

Department of Mechanical Engineering,
VITS College of Engineering,
Sontyam, Anandapuram, Vizag.

Abstract:

In automobile sector, the need for alternative fuel as a replacement of conventional fossil fuel, due to its depletion and amount of emission has given way for new technologies like Fuel cells vehicles, Electric vehicles. Still a lot of advancement has to take place in these technologies for commercialization. The gap between the current fossil fuel technology and zero emission vehicles can be bridged by hybrid technology. Hybrid vehicles are those which can run on two or more power sources/fuels. Feasibility of this technology is been proved in four wheelers and automobile giants like Toyota, Honda, and Hyundai have launched successful vehicles like Toyota prius, Honda insight etc.

This technology maximizes the advantages of the two fuels and minimizes the disadvantages of the same. The best preferred hybrid pair is electric and fossil fuel. This increases the mileage of the vehicle twice the existing and also reduces the emission to half. At present, we like to explore the hybrid technology in the two wheeler sector and its feasibility on road. This paper deals with an attempt to make a hybrid with electric start and petrol run. Further a design of basic hybrid elements like motor, battery, and engine. As on today, hybrid products are one of the best solutions for all pollution hazards at a fairly nominal price. An investment within the means of a common man that guarantees a better environment to live in.

Key Words:

alternative fuel, emissions, hybrid, dual fuel and pollution hazards.

INTRODUCTION:

Since the last two decades the judiciary and policy makers 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 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. 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 and
- Efficiency

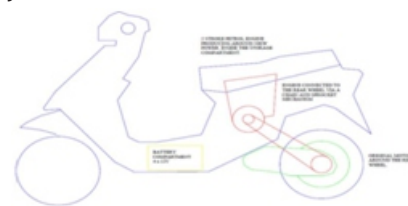


Fig.1.1 Basic Model

SPECIFICATIONS:

5.1 Specifications of Electric Bike:



Description:

This electric scooter is imported or manufactured by Electro herm. This vehicle has a top speed of 45 Km/hr and autonomy of approximately 75 to 80 km @ 70kg & 55 to 60 @ 130 kg on a single charge. This product requires registration and a license to drive. YO Speed is India's 1st electric vehicle which is approved by ARAI in 750 W categories. Its powerful 750w motor gives it much higher speed and enables it to even seat two people easily. With its high efficiency and cost effectiveness, the Yospeed is here to free mankind from the clutches of petrol. Yospeed runs for 500km in Rs.50/- ARAI Certification were attained for this product.

SPECIFICATIONS:

Range/Autonomy: 75 to 80 km @ 70kg & 55 to 60 @ 130 kg
 Top Speed: 45 Km/hr
 Weight: 130 Kg carrying capa
 Motor: Permanent Magnet BLDC Motor
 Wattage: 750 W
 Batteries: VRLA 33Ah x 4
 Voltage: 48 V
 Charge Time: 6 - 8 hours
 Wheels: 3.00 * 10.00"

5.2.TVS XL:

Moped is not much popular now a days may be because of the old look, less speed and engine performance of average. But if you are looking for an economical moped which ensures your safety, easiness to drive, gearless, economical by durability and less maintenance cost.

5.2.1 Top Technical Facts of TVS XL:

- Super HD 2 Stroke,
- 69.9cc Single Cylinder engine
- 3.5 Bhp at 5000 rpm power
- Torque of 5.0 Nm at 3750 rpm
- 55 to 60kmpl mileage
- Drum brakes in front and
- Rear 50W Electronic ignition Centrifugal Wet Type clutch.

5.2.2 Engine Performance and Mileage:

TVS XL Super HD powered by a 2 Stroke, 69.9cc Single Cylinder engine that can offer you 3.5 Bhp at 5000 rpm power and torque of 5.0 Nm at 3750 rpm. Engine mated with automatic gears too. It can bear good load too. Initially the mileage will be less but after that you will get nearly 55 to 60kmpl mileage on ride (Based on user's experience).

5.3 Safety and Comfort Features:

TVS XL Super HD moped is almost similar to the earlier version TVS XL Super. The added features include weight difference and the use of split seat in new version. Easy to handle this moped with good suspension, drum brakes in front and rear. It features Fly wheel magneto 12V, 50W Electronic ignition, Centrifugal Wet Type clutch, 4 litres fuel tank, foot rest, spoke wheels, analogue fuel gauge and speedometer etc.

FABRICATION & MODIFIED REASSEMBLY



Fig.6.1 Electric Bike

This is a 750 watts electric bike which we adopted to make dual power bike (fuel cum battery bike), it can carry up to 200 KGS load. This is a full working bike. We have charge the more than 6hr a day to get full charged. There is a speedo meter and battery 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.



Fig.6.2 Arrangement of fuel engine to E-bike

In this figure we can see the assembled a fuel engine at the front of the rear wheel and it is clamped to the body frame with the support of iron flat rods, nut and bolts. The figure shows us the engine assembles at the bottom of the seat and at the front of the rear wheel. The engine is perfectly aligned to the back wheel to avoid the back wheel misplace and a gear wheel is fixed to the rear wheel to connect the engine with the help of chain link.

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. 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 back wheel with the support of battery charging and we can see the fuel engine is assemble at front of the rear wheel.



Fig.6.3 Overall view

Figure show us the overall view of the bike and total assemble of the bike parts to the chassis and an empty space at the front of the fuel engine is for batteries. In this figure we can see the coil wire connections and fuel pipe connections. The empty space at the foot is for the 2-12volts battery and the wire connections are already given to the coil.



Fig.6.4 Wire Connections

This figure shows us the wire connections of the battery coils and fuel engine fuel pump connections and the back wheel. The wire connection is given to the back wheel from the coil. The coil the is serviced and assembled to the bike chassis .



Fig.6.5 Suspension Arrangement

This figure shows us the suspensions were connected to the wheel shaft and body frame to avoid the up and down of the road. The fuel engine of a TVS XL is assembled to the body frame of the electric bike without making many alternations to the body frame of the exited bike and the all the required parts of the TVS XL were assemble to the bike frame of the electric bike body frame. The wire connections of electric bike are perfectly separated from one other without any confusion. The wire connection the coil is separated and the wire connection to the fuel engine is separated.



Fig.6.6 Fabrication process

In this view we can clearly see the overall wire connections of the fuel engine and overall view of the fuel engine parts. The engine is clamped to the body frame of the bike with the help of the MS flat rods with the help of nut at one end and other end is welded to the body frame. Various views of fabrication process:



Fig.6.7 Brushed controller

Brushed controller consists of speed controller, in order to control speed of e-bike.



Fig.6.8 Space Allocation for batteries



Fig.6.9 Fuel Tank

In this figure we can observe the fuel tank which is arranged at the back end of the electric bike and pipe connection is given to the fuel tank to the engine. The pipe will pass the fuel to the engine to run and a valve is connected to the pipe at the fuel tank to control the flow to the petrol to the engine.



Fig. Sprocket of Engine



Fig. Sprocket of Rear wheel

In this figure we can see the gear wheel is fitted to the back wheel of the bike for the chain link for the rotation.

To the gear wheel is connected with chain and other end of the chain is connected to fuel engine shaft. When the engine shaft is rotate the back wheel is rate with the help of the chain mechanism this the way we connected the fuel engine to the electric bike to work the both fuel and electric bike.

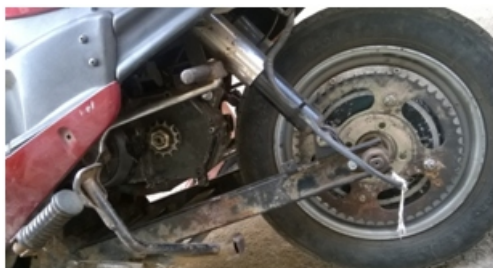


Fig.6.10 Direct drive from Sprocket of Engine to Rear Wheel

In this figure we can clearly observe the gear wheel is connected to the engine shaft and a kick lever. The gear wheel is connecting to the engine shaft which is used to connect the rotate the back wheel with the help of the chain. The chain is connected to the engine gear wheel and to the back wheel gear with the help of the chain. When the engine starts the shaft will rotate and the back wheel will rotates. In this process the bike will moves with fuel engine.



Fig .Arrangement of Batteries

In this figure we can clearly observe the 2-batteries place at below the bike seat and wire connection given to the batteries and to switch and the wire passes to the back wheel coil from this when we start the energy is supply the coil from the battery and the back wheel rotates and there is trip off switch is arranged as well to control the energy consumption of the batteries.



Fig .Arrangement of Batteries at Foot rest

In this figure we can clearly observe the 2-batteries place at below the bike foot rest and wire connection given to the batteries and to switch and the wire passes to the back wheel coil from this when we start the energy is supply the coil from the battery and the back wheel rotates and there is trip off switch is arranged as well to control the energy consumption of the batteries.



Fig.6.11 Petrol knob

In this above figure ,petrol knob/switch is arranged near the foot rest and it is used to switch on the engine.

Working Principle:

The working principle of DUAL POWER BIKE basically involves two processes, the first process involves when the vehicle is running by means of an electric motor and the second process involves when the vehicle is running by means of internal combustion engine. When the vehicle is driven at the outside of city and need more torque to drive the vehicle is powered by means of internal combustion engines. The power from the engine is taken from the pulley and then it rotates the wheel. During this process the vehicle is charged by means of a generator used. The power is generated through generator is by connecting the generator shaft with the shaft of the wheel by means of V Belt. When the vehicle is driven inside the city, running in the plain and need of low torque the vehicle is powered by means of a motor. The power to run the motor is supplied from the battery, as the battery is already charged when the vehicle. During this process the speed of the vehicle will be minimum and there is no smog forming pollutants produced during the vehicle runs. When the vehicle is powered by means of electric motor the power from the internal combustion engine will be disconnected from the shaft by loosening the belt. 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.

In this process the motor cum generator serves as motor as well as generator. It serves as a motor when the vehicle is running by means of battery and it serves as a generator when the vehicle is running by means of internal combustion engine. The following diagram shows the motor speed control circuit,

Specification:

- Voltage : 12V
- Current : 500mA
- Torque : 0.5Kg Cm
- Speed : 8000rpm in unloading
- Speed: Above 3000rpm in loading.

Performance Data:

- Range per charge 70 Km
- Gross Vehicle Weight 80Kg
- Battery Weight 5.3 Kg
- Pay Load Capacity 100 Kg
- Seating Capacity 2
- Max. Speed 40 Km/h
- Energy Consumption 0.5 KWH / Km
- Voltage 12V, 17Ah
- Current 3.4 amps
- Cycle use 14.114.4V
- Standby use 13.613.7V
- Constant voltage charge with voltage regulation.

RESULTS AND DISCUSSION:

The Cost analysis to distance is as shown in the below table.

Table.7.1 Cost Analysis and Distance:

Mode	Person weight	Price	Distance KM	Price per unit distance
Petrol	58	70	54	1.2
Battery	58	6	33	0.18
Total in petrol and electric	58	76	87	0.87

Thus from the above table we can clearly say that the amount of fuel consumption using the hybrid vehicles will be less.

Features of Dual Power Bike:

- In heavy traffic and inside the city there is no chance for moving fast. At that time, if vehicle is run by engine, more fuel is wasted due to variation of acceleration. If it is run by battery, the consumption of power is reduced.
- During less load working condition, vehicle can be easily run by mean of battery instead of by engine, when high torque is required it can be changed to engine operated.
- Variation of speed from 10500rpm can be obtained by using battery operated motor.
- When vehicle is heavily loaded, need of high torque (hills, slopes) and need of high speed, it can be obtained by internal combustion engine.
- Comparing with normal commercial and hybrid bikes, it is better and having more advantages.
- Regarding manufacturing cost and selling price is less than other bikes by means of additional feature. For example Honda Civic car having these types of features but its cost is around 25 lakhs. So it is suitable for middle class people.
- More features for low cost.
- The bike is available for price of less than 35 thousand.
- Pollution will be reduced and no noise can be produced around hospitals, schools and other places.

7.1 Advantages:

Dual Power Bike has several advantages over conventional vehicle:

- Regenerative braking capability helps minimize energy loss and recover the energy used to slow down or stop a vehicle.
- Engines can be sized to accommodate average load, not peak load, which reduces the engine's weight.
- Fuel efficiency is greatly increased (Hybrids consume significantly less fuel than vehicles powered by gasoline alone).
- Emissions are greatly decreased.
- It can reduce dependency on fossil fuels because they can run on alternative fuels.
- Special lightweight materials are used to reduce the overall vehicle weight of HEVs. The HEVs available for sale are very cost competitive with similar conventional vehicles. Any cost premium that may be associated with HEVs of the future can be offset by overall fuel savings and possible incentives.

Auto manufacturers are making these HEVs with comparable performance, safety, and cost because they know that these three elements are most important to consumers. Any by combining gasoline with electric power, hybrids will have the same or greater range than traditional combustion engines. The HEVs is able to operate approximately two times more efficiently than conventional vehicle. Honda's Insight can go 700 miles on a single tank of gas. The Toyota Prius can go about 500 miles. For the driver, hybrids offer similar or better performance than conventional vehicles.

Advantages over Other Vehicles:

There are a number of high performance and even higher mileage electric vehicles that are set to new released in a few short years (none of them coming from major auto companies so the prices may be high for the average working class American) with reduce charge times (as little as an hour which means you could recharge while you are shopping, or eating at a restaurant, watching a movie, visiting friends and family, at the park, sport games, etc.) also the with the implication or solar panels an lighter bodies the electric vehicles range will surpass some of the most fuel efficient automobiles on the road today.

As for the whole longer tailpipe thing (i.e. the vast majority of electricity is produced from polluting non-renewable resources) we are currently making great strides to switch to clean renewable resources for all of our power needs, also it has been proven that electric vehicles their electric power from our polluting power grid are still better for the environment due to their sheer efficiency. The looks of the electric vehicles are finally starting to look like normal vehicles and they perform with some of the best supercars in the world. Considering that the average American only drives between 25 and 50 miles per day the range of 250 miles per charge is more than enough (especially considering that you can recharge almost anywhere). Therefore electric vehicles are some of the best performance and most efficient vehicles that should be on the road and will be on the road for many decades to come.

7.2 Disadvantages:

- High initial cost.

- Overall weight of the bike increases.
- Different Driving Experience.
- New parts and servicing can be inconvenient and expensive.
- There may be a short circuit problem in the electric components.

7.3 Application Areas:

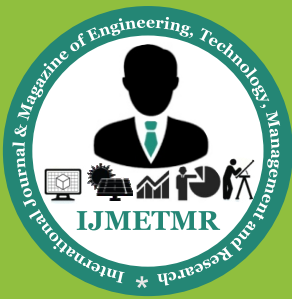
- Intra – City commuter service
- Bird sanctuaries, zoological parks.
- Airport shuttle service
- Government departments.
- Industrial establishments, townships / satellite colonies.
- Postal service
- Golf clubs, schools, colleges / institutes welfare centres.
- Courier service and mobile kitchen services.

CONCLUSION:

The technology of dual powered bikes is an emerging field in now a days and the total turn one on these types of vehicles very profitable for the future and also solves the issue of natural resources scarcity and is an eco-friendly bike. This type of vehicle is very cost effective for middle-class families. The mileage of the bike is increased from 60 to 90 km for 1 litre of gasoline.

REFERENCES:

- [1] Internal combustion engines by Haywood
- [2]. Automobile engineering volume 1 by Kirpal Singh.
- [3]. www.crcpress.com. Automotive Engineering
- [4]. Thermal Engineering by R.K.Rajput
- [5]. Modeling of Components for Conventional cars and hybrid vehicles by J Wallén - 2004 - Cited by 6 - Related article
- [6]. Automobile engineering by GBS.Narang.
- [7]. Environmental Activities. (2009). Retrieved December 01, 2009, from Lithium-ion battery for Hybrid Electric Vehicles.



[8]. Alliance Bernstein, “The Emergence of Hybrid Vehicles: Ending Oil’s Stranglehold on Transportation and the Economy,” June 2006.

[9]. Shah, Saurin D. (2009).”2Electrification of Transport and Oil Displacement”.In Sandalow, David. Plug-In Electrical Vehicles: What Role for Washington. Brookings Institution.

[10]. The Trouble with Lithium Implications of Future PHEV Production for Lithium Demand, December 2006.

[11]. Wikipedia - Hybrid Vehicle Drive train.

[12]. Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle. Environmental Protection Agency Office of Transportation and Air Quality. February 2005. Retrieved 2 August 2010.