Fabrication and Development of Hybrid Vehicle (scooter)

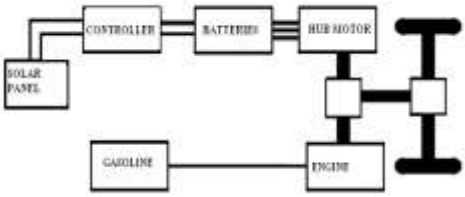
Dr. Nataraju S N[1], Prem singh*[1],Raghavendra Prasad C*[2] ,Somashekar G*[3],Manoj N*[4]
[1]*Assistant professor Department of Mechanical Engineering. SJCIT Chickballapur-562101*
[2,3,4]*UG scholars,Department of Mechanical Engineering. SJCIT Chickballapur-562101*

Abstract *— Hybrid motor vehicles, runs using conventional and non-conventional energy sources that is petrol and solar energy. The aim is to fabricate and optimize a two stroke engine vehicle powered by both battery and gasoline. It has greater advantage over previously used gasoline engine and that is the major source of air pollution. The operational cost is ten times less than that of petrol. The main propulsion units consist of a two stroke internal combustion engine and a hub motor attached to the front wheel of the scooter .A Hybrid electric vehicle which depends not only on batteries but also on an internal combustion engine. The method used to optimize the energy and fuel consumption of the hybrid electric scooter is the multi-mode approach. The fuel economy as well as battery usage are primary factors to be considered in the operation of hybrid vehicles. Hybrid scooters have a great potential in lowering emissions and reducing fuel demand as the ever growing problems of air pollution and global warming reached its critical stage .Hybrid motor vehicle configured to travel by using by an electric motor in addition with solar energy to an engine power have been developing. Along with solar panel that is mounted on the body of the scooter which is connected to the battery and further connected to the hub motor*

Keywords — *Hub motor, Battery, Solar panels, Fabrication, optimization, Solar energy.*

I. INTRODUCTION

Around 93% of today's automobiles run on petroleum based product, which are estimated to be depleted by 2050. Moreover, current automobiles utilize only 25% of the energy released from petroleum and rest is wasted into the atmosphere. Despite recent efforts to improve fuel efficiency and reduce toxic emissions in cars, emissions have continued to increase steadily in the past two decades. For preservation of gasoline for future and increasing the efficiency of vehicle an electric vehicle can be a major breakthrough. An electric vehicle is pollution free and is efficient at low speed conditions mainly in high traffic areas. But battery charging is time consuming. Moreover, it cannot provide high power required by drives during high speed conditions or in slopes of hilly areas. Gasoline engine proves its efficiency at higher speeds in high ways and waste a lot of energy in urban areas. A hybrid vehicle solves these problems by combining the advantages of both the systems and uses both the power sources at their efficient conditions. The objective of this project aims at better utilization of fuel energy and reduces dependence on non-renewable resources using latest technology. The implementation involves development of Hybrid vehicle that uses battery as well as gasoline power for Propulsion



A. Energy Sources

Our project consists of both conventional and nonconventional energy sources i.e Solar energy and Gasoline these type of vehicles depends not only on batteries but also on ic engines. Solar energy is the renewable energy that is collected from resources which are naturally replenished on a human timescale. Renewable energy often provides energy in many important areas one among them is electricity generation using solar panels.

B. Engine Modeling

The work discloses a hybrid system consisting of an Electric and Internal Combustion(IC) based power drives. The front wheel is being propelled by battery and the rear wheel is powered by gasoline, i.e, it includes a single cylinder, air cooled internal combustion engine and a BLDC motor based electric power drive used for hybrid powering of the vehicle. The controller is designed to implement the switching between IC Engine and Electric motor depending on the power requirement and load conditions.

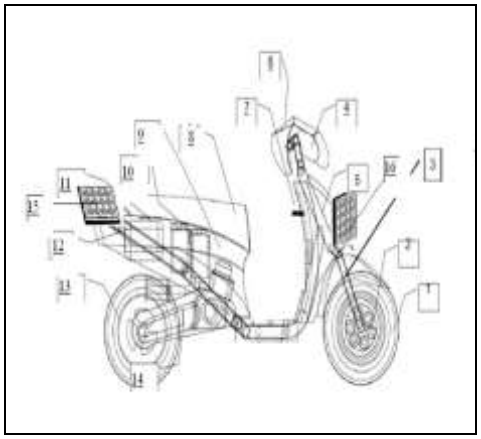


Fig. 1: Hybrid scooter parts

1)Tyre 2)Hub Motor 3)Suspension 4)Headlamp 5) Body Cover 6)Display 7)Hub Motor Controller 8)Seat 9)Engine 10)Front Battery 11)Fuel Tank 12)Chassis 13)Rear Tyre 14)Transmission 15),16)Solar panels.

The vehicle at lower speed runs with gasoline and at high speed it changes to electrical by manual method shows the attachment of tyre with the hub motor (2). There is no need for any gear reduction since the torque produced is sufficient enough to drive the vehicle. The axel of the motor is connected to the suspension (3). Suspension is connected to the handle which is connected to the main chassis. Accessories such as headlamp (4), display (6) are included as user aid .Four batteries are placed near the fuel tank. Engine (10) is connected to the main chassis and seat (9) is situated above the engine

II. METHODS OF FABRICATION

A. Cutting

There are many ways to cut nowadays. The old standby is the saw. Others now include plasma torches, water jets, and lasers. There is a wide range of complexity and price, with some machines costing in the millions.

B. Folding

Some parts need to be bent. The most common method is a press brake (or brake press). It has a set of dies that pinches the metal to form a crease. This operation can only be performed in very specific cases due to the movement of the part and the possible shape of the dies. Designing for Lean manufacturing, though, can help prevent complex shapes that slow down production. Sometimes using two different types of fabrication processes or two different pieces fastened together work better than one complicated piece.

C. Machining

This is the process of removing metal from a piece of material. It might be done on a lathe, where the material rotates against a cutting tool, or in some other cutting machine where a rotating tool is moved in a variety of ways against a stationary piece. Drills fall into this latter category. The range of motion of the cutting head is defined by the number of axes (i.e. a 3-axis machine).

D. Punchin.

Punching is the act of a punch and a die forming a 'scissor' effect on a piece of metal to make a hole in it. Obviously, the punch and die must be the same shape and size of the desired hole. In some cases, the main piece of material is kept, as in when holes are added for fasteners. In other cases, the piece that is removed is the desired product-this is called 'blanking'.

E. Shearing

Shearing is the process of making a long cut on a piece of metal. It is, in effect, just like the action of one of those paper cutters with the long chop-handle. This is done on sheet metal.

F. Stamping

Stamping is very similar to punching, except the material is not cut. The die is shaped to make a raised portion of material rather than penetrating.

G. Welding

Welding is the act of joining two pieces of metal together. A variety of types of welding exist for use in different applications and for the range of metals used in manufacturing.

III. METHOD USED

Welding is a fabrication that joins materials, usually metals by causing fusion which is distinct from lower temperature metal-joining techniques such as brazing and soldering which do not **melt** the base metal. In addition to melting the base metal, a filler material is often added to the joint to form a pool of molten material that cools to form a joint that can be as strong, or even stronger, than the base material. Pressure may also be used in conjunction with **heat,** or by itself, to produce a weld. In this project we have used welding and riveting joint process of fabrication so that gives higher stability to withstand the solar panels under design consideration under any circumstances. This is the best method which we have opted.

IV. FABRICATION OF VEHICLE

Mode of fabrication is that, the hub motor is fixed to the front wheel of the vehicle which gets charged by the batteries through solar panels. Controllers are palced in between the solar panels and batteries, so that current will not flow in

reverse direction. Solar panels are fixed to the vehicle by welding and revit joints. However this electric vehicle depends not only on batteries but also on gasoline. Initially the vehicle starts with the gasoline and when it reaches certain speed the vehicle is switched from gasoline to electric power.

Fig. 2

A. Specifications Of Vehicle

Dimension

Overall height	-	1060mm
Overall length	-	1685mm
Overall Width	-	1220 mm
Wheelbase	-	120 mm
Kerb weight	-	79.5 kg
Fuel Tank Capacity	-	3.5 Liters

Engine

Type	-	Air Cooled
Stroke (2/4)	-	2 Stroke
No. of cylinders	-	Single Cylinder
Bore x stroke mm	-	42.6 mm x 42
Displacement	-	59.9cc

B. Solar Panels

Width	-	350 mm
Length	-	500 mm
Voltage	-	12V

Current: 20A

Power (P) - Voltage (V)*Current (I)

P= 12*20 - 480W

C. *Battery*

18ah, Voltage	-	12 v
Weight	-	6kg

D. Hub Motor

Voltage	-	48V
Power	-	350W
Weight	-	4.6 Kgs
Motor Diameter	-	0.148m
Motor Shaft Diameter	-	0.214m
Maximum speed (rpm)	-	300rpm

E. Hub Motor

Hub motor electromagnetic fields are supplied to the stationary windings of a motor. The outer part of the motor follows those fields that turn the wheel that is attached. In a brushed motor, energy is transferred by brushes which are in direct contact with the rotating shaft of the motor. In a brushless motor, the Energy is transferred electronically, with no physical contact between stationary and moving parts. Although the brushless motor technology is more expensive, most of them are more efficient and longer-lasting than brushed motor systems. Electric motors have greater torques at startup, making them more suitable for vehicles as they need the most torque at startup too. Their greatest torques occurs as the rotor first starts turning and this is why electric motors do not require a mode. A gear-down arrangement might be needed, but unlike in a transmission type combustion engine, shifting is not needed for electric motors.

Fig. 3

F. Solar Cell

A solar cell (also called a photovoltaic cell) is an electrical device that helps in the conversion of light energy directly into electrical energy by creating voltage when it gets exposed to light. It is a form of photoelectric cell which, when exposed to light, can produce and support an electric current without being attached to any external source of voltage, but requires an external load for power consumption.

Fig. 4

This is the field of technology and research related to the practical application of photovoltaic cells in producing electricity from light, though it is more commonly used to refer to the generation of electricity from sunlight. Cells can be described as photovoltaic also when the light source is not necessarily sunlight (lamplight, artificial light, etc.). In such cases the cell is sometimes used as a photo detector (for example infrared detector), for detecting light or other electromagnetic radiations near the visible range and measuring light intensity.
The working of a photovoltaic (PV) cell requires 3 basic features:

1. The absorbing of light, generating electron-hole pairs.
2. The separation of charge carriers of unlike types.
3. The separate extraction of those carriers to an external circuit

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V. ADVANTAGES

- Maximum output can be obtained.
- It does not cause any environmental pollution like the fossil fuels and nuclear power.
- Solar cells last a longer time and have low running costs
- Low power consumption.
- Conservation of energy
- Utilization of free available source of energy from sun
- Storage of energy into rechargeable battery.
- Stored energy is used for running hub motor.
- High efficiency can be achieved using inverter

VI. DISADVANTAGES

- Periodic Monitoring and Maintenance is required.
- A drastic environmental change cannot be tolerated by the equipment.
- The entire process of manufacture is still very expensive as silver is used for interconnection of these cells in the solar panel, which is a very expensive metal.
- A practical problem linked with the use of solar cell panels is regarding the storage of electricity general by them.
- The conversion of DC to AC uses inverter before using any appliance and thus it increases the cost of such solar panels as the sources of electricity.

VII. RESULTS

Table. 1

	Weight	Speed/hr
Petrol Engine	145kg	45kmph
Hybrid Vehicle (Petrol engine + Electric power)	175kg	30kmph

VIII. CONCLUSIONS

Our project ―Hybrid Scooter is mainly intended to fabricate a scooter which runs with renewable energy and non renewable i.e., the solar energy and gasoline. The main advantage is that it can be directly charged by solar panel instead of using electric power and saves the energy and reduces pollution. Combination of both solar and gasoline gives good efficiency when compared to other gasoline and electric bikes

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