

Fabrication and Modification of Hybrid Vehicle

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Abstract— In Automobile sector with the advancement in 21st Century the need for alternative fuel as a replacement of conventional fossil fuel due to this depletion & amount of emission has given way. The paper start with history of hybrid vehicles our paper is based on the explanation of technologies their functions, drawback, efficiency. The conventional I.C Engine is the major source of pollution. The objective is to fabricate a hybrid car powered by both battery & gasoline. Hybrid vehicle relies not only on batteries but also on internal combustion engine which drives a generator to provide electricity & may also drive a wheel. This vehicle is highly suited for growing urban areas with high traffic. Initially the designing of vehicle. Equipment & their cost analysis are done it deals with fabrication of vehicle. This includes assembly of I.C Engine & its components the next phase consists of implementing the electric power drive & designing the controllers. The final stage would consists of increasing the efficiency of vehicle in economic ways.

Keywords: Electric Power Drive, Designing the Controllers, Replacement of Conventional Fossil Fuels, Powered by both Battery and Gasoline

I. INTRODUCTION

The significant growth of today's cities has led to an increased use of transportation, resulting in increased pollution and other serious environment problems. Gases produced by vehicle should be controlled and proactive measures should be taken to minimize these emissions. The automotive industry has introduced hybrid cars. Any vehicle is a hybrid when it combines two or more sources of power. For example such as moped with pedal. Hybrid vehicle is considered as the most industrially matured technology & has efficiency more than cars running. Currently, the hybrid vehicles which are running are like when the vehicles turn the battery power & turn off 2-cylinders & the vehicle runs on 2-cylinder & battery power but this vehicle will be like running totally on battery or an IC engine just as the Petrol-CNG car.

A. Concept of HEV:

A gasoline electric hybrid vehicle is an automobile which relies not only on gasoline but also on electric power source. In HEV, the battery alone provides power for low speed driving conditions it can't be used at long highway & hill climbing. It will provide better fuel economy & lesser environmental impact over conventional automobiles.

B. Fabrication of HEV:

The placement of the battery's will be in the front hood or in below the front seat in a "TATA NANO" there's a lot of space available in it. The battery stand will be a metal welded stand. The motor will be connected to the front wheel hub while will give us a front wheel electric drive.

The fabrication work is further shown in the table below:-

Component	Percentage Manufactured (Company made)	Percentage Fabricated in workshop
Engine	100%	-
Transmission	100%	-
Chassis	50%	50%
Hub motor	100%	-
Stirling Engine	100%	-
Suspension	100%	-
Tyre	100%	-
Motor Controller	-	100%
Power Control System	-	100%
Assembly of components	-	100%
Analysis System	-	100%

C. Objectives

- 1) Making low cost Hybrid vehicle.
- 2) Cheaper to maintain
- 3) Comparatively Lighter than current Hybrid cars
- 4) Improvising Efficiency

II. CHANGES WILL BE DOING

We will be replacing the Dead Axle with Live Axle for transmission of power to the Wheels. For suspension, we will be using Telescopic Spring instead of the usual Coil Spring present in the Car. To transmit the Power or Drive to axle, BLDC Motor will be proving torque to the Differential on the Rear axle and further to the wheel. Brushless DC Motor have high efficiency and better load carrying capability. The main purpose to use this type of specified motor is that the cost of the motor is low. It can save 30% to 50% of power consumed by a normal motor. It is small in size it can have high torque at low speed. We will also be replacing the Drum Brake with Disk Brake so as to eliminate the Complex Assembly in the vehicle. With the help of an electric circuit we will be providing A Switch so as to chance the drive from IC Engine to the Electric Power and vice versa.

A. Methodology Considered in Fabrication

The placement of the battery's will be in the Rear portion the vehicle as that's the suitable place as per the design consideration seat in a "MARUTI 800 "The battery stand will be a metal welded stand. The motor will be connected to the Differential while will give us a Rear wheel electric drive. For this placement we have to alter the suspension & the braking system by changing the dead axle of vehicle into a live axle.

1) Placement of Rear Axle:



We replaced the rear axle of Maruti with the rear axle of omni due to the same width of the axle. We added a two base plates by gas welding to give support for the suspension system of the vehicle.

The rear axle with the differential was placed inverted so that the placement of the motor should be at ease.

2) Placement of Motor:

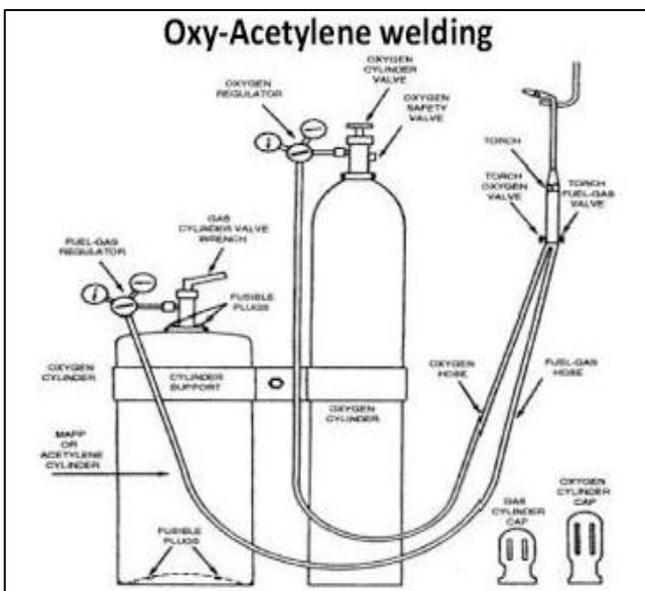


Since the rear axle was mounted inverted we have to Arc weld the L-brackets together for the placement of the motor.

B. Welding

We have used gas welding to weld or attach the rear axle with the rear wheels which is connected with motor And a electric welding to attach the 'BLDC' motor with the rear axle for having some free play.

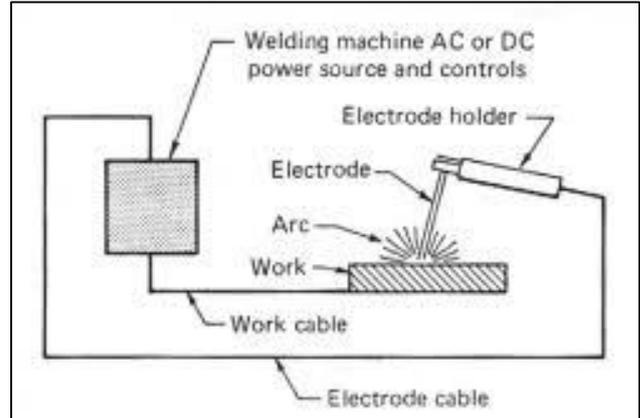
C. Types of Welding Used



1) Gas Welding

Metal joining process in which the ends of pieces to be joined are heated at their interface by producing coalescence with one or more gas flames (such as oxygen and acetylene), with or without the use of a filler metal. Gases used in welding and cutting processes include: Shielding gases such as carbon dioxide, argon, helium, etc. fuel gases such as acetylene, propane, butane, etc. oxygen, used with fuel gases and also in small amounts in some shielding gas mixtures.

2) Electric Welding



Arc welding is a welding process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals.

D. Approximate Cost Estimations

- MARUTI 800:- Rs. 18000
- Battery :- Rs. 14000
- Motor :-Rs. 8500
- Differential :-Rs. 5500
- Gear lever lock :-Rs. 1200
- Control circuits:- Rs. 3500
- Wirings and Connectors :- Rs. 1000
- Miscellaneous :- Rs. 8000
- Total Appx. Cost ≈ Rs. 6000

RUNNING COST ANALYSIS		
Sr. No.		SURVEY DONE BY and vehicle used
		SELF (Maruti 800 Hybrid Vehicle)
1.	Total distance covered	Kharghar to Thane (32 kms)
2.	No. of kms driven at high speeds (on IC engine)	20 kms (avg. 50 kmph)
3.	No. of kms driven at low speeds	12 kms (avg. 15 kmph)
4.	Running costs when driven at high speeds	Rs. 102
5.	Running costs when driven at low speeds	Rs. 63
6.	Total Running cost when driving on IC engine	Rs. 165
7.	Total Running cost when driving on Hybrid (IC+Electric)	Rs. 102+10=112
8.	% Running cost savings in Hybrid vehicle compared to IC vehicle	32.12%

RESULT

❖ Total Energy Capacity (4 Batteries)

✓ $48V \times 26Amp = 1248 V$

❖ Rated Power of Motor

✓ 850 W

❖ Run Time

✓ 1.5 Hrs

❖ Max Speed of Vehicle on less Power

✓ 30 Km/hr

❖ Therefore, range of vehicle

✓ $30 \times 1.5 = 45 \text{ Kms}$

HEV is a vehicle that uses two sources of power gasoline & 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 efficient at high speed drive this HEV'S both made of operation occurs at their max efficiency. As this hybrid vehicle emits 50% less emission than normal vehicle it plays an important role for reducing pollution to certain extent without compromising with efficiency. Thus it is most efficient in urban areas mainly in high traffic where gasoline engines are least efficient as the energy from gasoline is being wasted away and creates pollution.

Total weight of MARUTI SUZUKI 800: 650KG

Weight of battery: 30 KG

Weight of electric motor: 2.5 KG

Weight of rear axle: 2 KG

E. Distribution:

Battery is to be placed in the boot.

Motor is connected to rear axle

Differential is to be place at rear axle

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III. FUTURE SCOPE

- 1) High power hub motor can be joined
- 2) High capacity batteries can be used
- 3) By using hub motors AWD can be made
- 4) Both IC engine and electric drive can be used whenever required.
- 5) Can be converted into fully electric vehicle in low cost.

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