

HEB

**Design and Fabrication of Smart Hybrid Vehicle**

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**Email ID: serviceheb@gmail.com****ABSTRACT**

One of the major concerns of the contemporary society is the issues pertaining to rapid depletion of fossil fuels as well as environmental impacts of their by-products. A momentous portion of the fossil fuel is consumed by all classes of transportation worldwide. Hence, hybrid electric vehicles (HEVs) had emerged: advertising 'fuel economy' and clean environment' as their main marketing catchphrase. This project deals with the design and fabrication of a smart hybrid vehicle which simple beads a petrol engine and a dynamo with which the batter is charged. The hybrid vehicles are best concept for future transportation. They have chosen of charging or using gasoline or two any other fuel, but in India setting up a e-stations is a new task with already insufficient electricity for domestic purpose and the cost of hybrid vehicle also non affordable by 80% of Indian population. This vehicle is self-power penetrating and high fuel efficiency. Alternator power is generated from a gasoline. vehicle completely works with battery and gasoline engine. Hybrid vehicles are one of the most promising options to reduce fuel consumption and environmental pollution. The major advantages of hybrid vehicles include higher vehicles include higher efficiency provided by smaller engine, lighter components and low part count. Moreover, energy is captured and reused in a hybrid vehicle, whereas, energy is lost through heat in a conventional fuel vehicle in most cases.

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## 1. INTRODUCTION

A compressed-air vehicle is powered by an air engine, using compressed air, which is stored in a tank. Instead of mixing fuel with air and burning it in the engine to drive pistons with hot expanding gases, compressed air vehicles (CAV) use the expansion of compressed air to drive their pistons. One manufacturer claims to have designed an engine that is 90 percent efficient. Compressed air propulsion may also be incorporated in hybridsystems, e.g., battery electric propulsion and fuel tanks to recharge the batteries. This kind of system is called hybrid-pneumatic electric propulsion. Additionally, regenerative braking can also be used in conjunction with this system. Now, it is a worldwide burning problem to find out the best alternatives of fuel and to make sustainable energy future. The current study predicts that if the oil is consumed at this current rate, then in a few years ahead, we will be running short of the oil resources soon. This leads to the search for the alternative energy source which may alternatively preserve oil source. Hybrid cars, Fuel cell powered cars, Hydrogen fueled cars will be soon into the market as a result of this. Our compressed air is one of those alternatives. Air, which is abundantly available and is free from pollution, it can be compressed to higher pressures at a very low cost, is one of the most considerable option since atmospheric pollution can be permanently wiped out. Whereas, so far all the attempts made to eliminate the pollution has however reduced it, but complete eradication is still rigorously pursued.

Compressed air utilization in the pneumatic applications has been in use for long time. Air motors, pneumatic actuators and other various pneumatic equipments are in use. Compressed air was also used in some of the vehicles for boosting the initial torque. Turbo charging has become one of the popular techniques to enhance power and to improve the efficiencies of the automotive engines. The worldwide researches are also going on for other alternatives such as use of Hydrogen Fuel cell (which is presently very costly), use of biodiesel or use of compressed air vehicle engines which may be made of light material.

The concept of micro or mini compressed air engine can be one of the best alternatives for light vehicles, if it runs air alone and thus causing no pollution. It was also under study to develop a reciprocating automotive engine that completely runs on compressed air. Similar attempt has been made but to modify the existing engine and to test on compressed air.

## 2. MATERIALS USED

- Air compressor
- Air tanks
- Engine
- Batteries
- Electric Motors
- Solenoidal Valve

### 3. MODIFICATION REQUIRED

As the engine is supplied with the compressed air so compression stroke will not be required because when the compressed air will again be compressed the power output would not be sufficient .so the remaining strokes that we are left with are 3. If we study these remaining strokes then it is obvious that the intake stroke and the power stroke are same which leaves us with two strokes only. Now it is required to convert the selected 4- stroke engine to 2-stroke engine. Before going any further let us define these two strokes which will act in the compressed airengine.

#### 3.1 ALTERATIONS IN CAMSHAFTS

Mechanical component in the engine which is controlling the movement of the valves is camshaft. Camshaft controls the motion of the valves and if the profile of the camshaft is changed then the valves motion can be changed as is desired. Shown in figure below, is the cam shaft’s profile which is used in the four –stroke engine.

**Fig. 3.1** Camshaft’s Profile

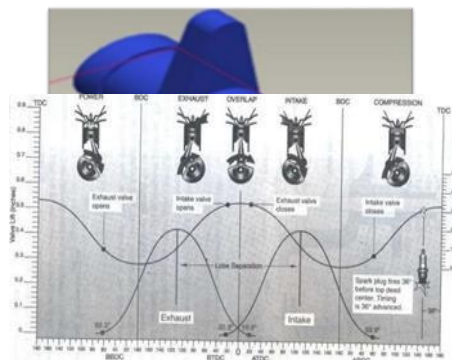
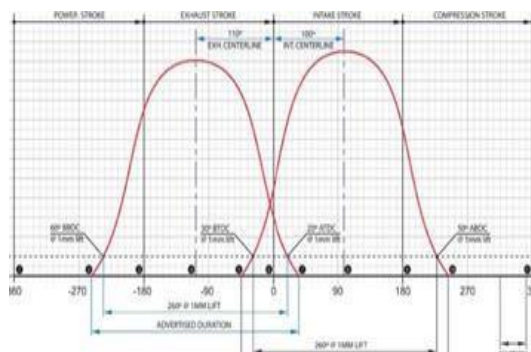


Figure 3-13 Valve timing profile. (Courtesy of Competition Cam, Inc.)

Following are the two diagrams representing the valves timing of a 4-stroke engine:

**Fig. 3.2** Valve Timing Profile

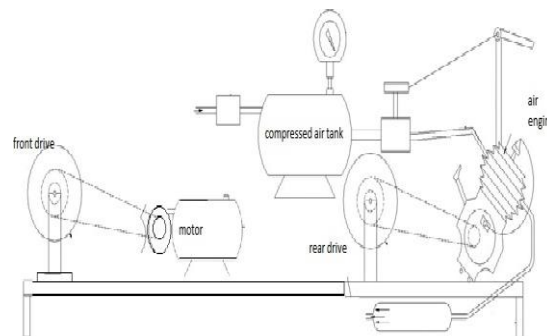


**Fig. 3.3** Graphical Representation of valve timing diagram

## 4. WORKING PROCEDURE

### 4.1 DESIGN LAYOUT

This project is to combine the two different propulsion system together to give transmission choice to the user and bring a user-friendly product. The project is to combine the air engine propulsion and electric propulsion together. The combined vehicle would look similar as shown in the fig. 4.1



**Fig. 4.1** Design layout

Our hybrid vehicle consists of two of propulsion that constitutes air engine and electric drive. The air engine propulsion system consists of a pressure vessel of air tank to store the compressed air. The air tank is fitted to two pressure gauges so as to measure the pressure inside the cylinder and another to measure the pressure of the air leaving the cylinder to the air engine. The air engine is a modified 4 stroke engine.

### 4.2 FRAME

The base of any vehicle is the frame. The frame is the structural member that bears the dead load and live load. The main functions of a frame in motor vehicles are to support the vehicle's mechanical components and body and to deal with static and dynamic loads, without undue deflection or distortion. These include weight of the body, passengers, and cargo loads, vertical and torsional twisting transmitted by going over uneven surfaces, transverse lateral forces caused by road conditions, side wind, and steering the vehicle, torque from the engine and transmission, longitudinal tensile forces from starting and acceleration, as well as compression from braking, sudden impacts from collisions.



**Fig. 4.2** Structural Member



**Fig 4.3** *Chassis*

It that case, our project has to bear pressure tank, air engine, batteries and the passengers to accommodate on the vehicle. Thus, the frame is made using the steel bars and plywood is placed to form the base for the accommodation.

### 4.3 AIR ENGINE PROPULSION

Initially the air tank is filled with compressed air of 80psi from a compressor available in the air filling zones in the petrol bunks. The stores compressed air serves as the fuel for moving the piston. The pressure range in the cylinder is indicated by the pressure vessel connected to the pressure vessel.



**Fig 4.4** *Air engine propulsion set up*

The pressure vessel is connected to the air engine by means of connecting tube attached with a valve to control the pressure entering the air engine. The pressure that is being entering the engine could be indicated by another pressure gauge and the valve could be used for controlling the air entering the engine. In our project we have to modify these four strokes into totally two strokes with the help of inner CAM alteration. In air engine we can design a new CAM which is operate only Inlet stroke and exhaust stroke.

Actually, in four stroke engine the inlet and exhaust valve open only one time to complete the total full cycle. In that time the piston moving from top dead center to bottom dead center for two times. A stroke refers to the full travel of the piston from Top Dead Center (TDC) to Bottom Dead Center (BDC). In our air engine project, we have to open inlet and exhaust valve in each and every stroke of the engine so that it will convert the four stroke engine to two stroke engine by modifying the CAM shaft of the engine.



**Fig. 4.5** *Rear Attachment with Air Engine*

As the engine runs, the crank shaft rotates and transmits the motion to the gear box. The shaft coming out of the gear box transmits the power to the rear axle through the chain drive. As the axle rotates the motion takes place.

#### 4.4 MOTOR PROPULSION

The motor drive is to propel the vehicle at the time in which the vehicle run out of the fuel. The motor drive is attached to the front wheel and the wheel handle is added to control the direction of the motion. The motor of 48volt is attached to the battery attachment provided at the back of the frame. The battery powers the electric motor drive to propel the vehicle and control of the motor drive is given to the handle to control the motion.



**Fig. 4.6** Battery Setup



**Fig. 4.7** Air engine powered hybrid Vehicle

## 5. CONCLUSION

- Compressed air for vehicle propulsion is already being explored and now air power vehicles are being developed as a more fuel-efficient means of transportation.
- Compressed air is stored in air tank which is passed to the engine at high pressure which pushes the piston which results in power transmission.
- Then air engine drive is sent to back wheel drive. The air can be reused again by passing through a compressor and the process can be repeated.
- Electric bike wheel is used for front wheel drive. Four electric bike batteries are required to run the motor which in turn runs the front wheel.
- The air engine is used mainly, when the air in the tank empties, we can switch to electrical system. The main scope of the project is to give an alternate source to oil fuels.

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