

# Air Powered Car - Future of Transportation

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**Abstract:** *Transportation is the most vital part in our day to day life. If it won't be there life would not be this easy. Transportation consist of cars, trucks, trains, etc. which requires petrol and diesel as a fuel to run. As we all know that fuel is non-renewable sources of energy and also the prices of fuel increases day by day. So under the vision of this concept we introduce some new ideas in this paper. Here we used AIR as a fuel to run the automobiles. As air is free to us and renewable source of energy and most reliable too. In this we used Air for intake and also we used carbon filter for removing the dust particles. For this we don't need petrol or diesel, we can directly run engine by air. This will be very helpful to people. Also it will be most useful for industries. Cost rate of transportation will be less. In future it will be more advantageous and useful. TATA MOTORS make an agreement with Motor Development International MDI of France to develop a car that runs on compressed air. Also it will be more economical and pollution free. The cost of refilling the air will be very less as compared to petrol or diesel.*

**Keywords:** Air Engine, Compressed tank, Compressed Air fuel

## 1. Introduction

We know that our world is facing fuel crisis now. All kinds of conventional source of fuel for the history of cars becoming more and more expensive and impractical especially from an environment. These factors are leading car manufacture to develop car fuel-cell-powered cars will roll onto the world's highway.

Compressed air as a source of energy in different uses in general and as a nonpolluting fuel in compressed air vehicles has attracted scientists and engineers for centuries. Efforts are being made by many developers and manufacturers to master the compressed air vehicle technology in all respects for its earliest use by the mankind. The present paper gives a brief introduction to the latest developments of a compressed-air vehicle along with an introduction to various problems associated with the technology and their solution. While developing of compressed air vehicle, control of compressed air parameters like temperature, energy density, requirement of input power, energy release and emission control have to be mastered for the development of a safe, light and cost effective compressed air vehicle in near future.

## 2. How Does Air Engine Work

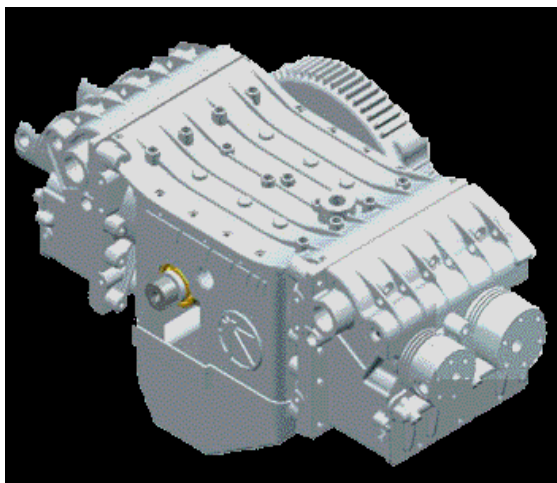


Figure 1: Air Engine

- Approximately 90m<sup>3</sup> of compressed air is stored in fiber tank in the vehicle.
- The engine is powered by compressed air, stored in a carbon-fiber tank at 30Mpa (4500psi). The tank is made of carbon fiber in order to reduce its weight.
- The engine has injection similar to normal engines, but uses special crankshafts and pistons, which remain at top dead center for about 70 degrees of the crankshaft's cycles; this allows more power to be developed in the engine.
- Also we can use Turbocharger for increasing the speed.
- The expansion of this air pushes the piston and creates movement. The atmospheric temperature is used to re-heat the engine and increase the road coverage
- The air conditioning system makes use of expelled cold air.

## 3. How Compressed Air Can Fuel a Car

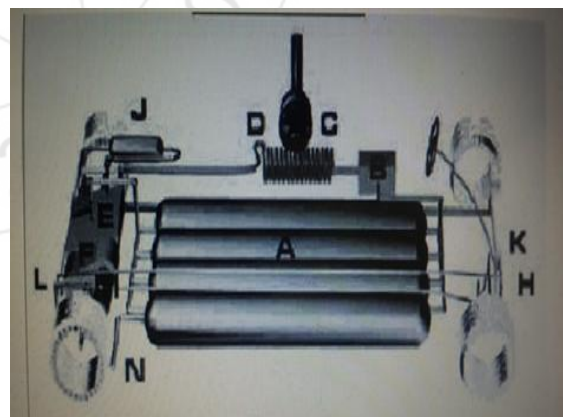


Figure 2: The Chassis

In practical terms compressed air at 300 bars is stored in the carbon fiber tank A. Air is release through the main line firstly to an alternator B where the first stage of decompression takes place. The now cold air passes through heat exchanger C which adds thermal energy to the air and provides a convenient opportunity for air conditioning D.

The warm compressed air now passes to the motor E where two more stages of decompression and reheating takes place. The motor drives the real axle G through the transmission F.

Volume 6 Issue 4, April 2017

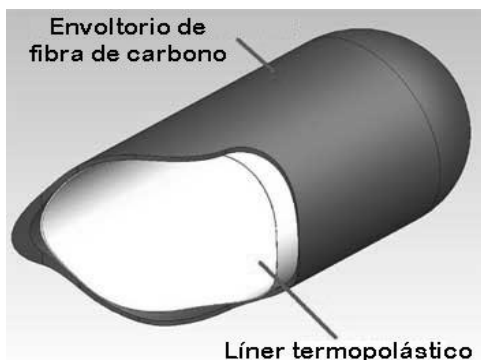
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Control of engine speed is through conventional accelerator pedal H controlling a valve within the motor.

air that comes out of the car is cleaner than the air that went in.

#### 4. Compressed Air Tanks



**Figure 3:** compressed tank

Compressed air tanks are one of the major part of this car. This tank holds 90 cubic meters of air compressed to 300 bars. It is similar to the tanks used to carry the liquid gas used by buses for public transport. The tanks enjoy the same technology developed to contain natural gas. They are designed and officially approved to carry an explosive product: methane gas.

In case of major accident, where the tanks are ruptured, they would not explode since they are not metal. Instead they would crack, as they are made of carbon fiber. An elongated crack would appear in the tank, without exploding, and the air would simply escape, producing a loud but harmless noise. Of course, since this technology is licensed to transport an inflammable and explosive gas (Natural gas), it is perfectly capable inoffensive and non-flammable air.

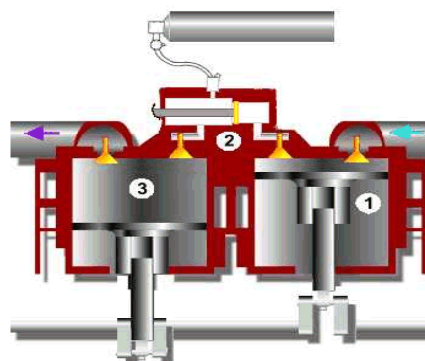
It is fitting, that MDI has reached an agreement with the European Leader in aerospace technology air bus industries for the manufacture of the compressed air storage tanks. With a remote supervision arrangement, Air bus industries overseas the making of the storage tanks at each MDI factory. The coiled carbon fiber technology used in the construction of the tanks is complex and requires a substantial quality control process which the multinational company, home of the Airbus aircraft, will provide for our vehicles.

#### 5. The Air Filter

- The engines work with both air taken from atmosphere and air pre-compressed in tanks. Air is compressed by the on-board compressor or at service station equipped with a high pressure compressor.
- Before compression, the air must be filtered to get rid of any impurities that could damage the engine. Carbon filters are used to eliminate dirt, dust, humidity and other particles which unfortunately are found in the air in our cities.
- This represents a true revolution in automobiles – it is the first time that a car has produced minus pollution, i.e. it eliminates and reduces exciting pollution rather than emitting dirt and harmful gases. The exhaust pipe on the car produces clean air which is cold on exit (between  $-15^{\circ}$  and  $0^{\circ}$ ) and is harmless to human life. With this system the

#### 6. Technology Description

The following is the description of the actual functionality of the motor.

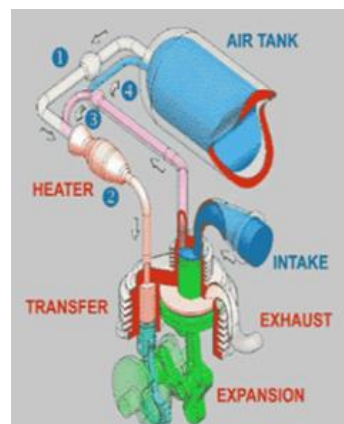


**Figure 4:** Structure of Air Engine

#### 7. Process Description

1. The first piston takes in ambient air and compresses it to approximately 300 psi and 200 \*F in the compression chamber during the first cycle of the engine.
2. When the piston pause, a small amount of compressed air from the tanks is released into the expansion chamber to create a low pressure, low temperature volume of about 140psi.
3. Shortly before the valve to the exhaust cylinder is opened, a high speed shutter connects the compression and expansion chambers.
4. The sudden pressure and temperature difference between the low chambers creates pressure waves in the expansion chamber, thereby producing work in the exhaust chamber that drives the piston to power the engine.
5. The air tanks for storing the compressed air are localized underneath the vehicle. They are constructed of reinforced carbon fiber with a thermoplastic liner. Each tank can hold 3,180 ft<sup>3</sup> of air at a pressure of up to 4,300 psi. When connected to a special compressor station, the tanks can be recharged within 3-4 min. They can also be recharged using the onboard compressor 3-4 hours after connecting to a standard power outlet.

#### 8. Working



**Figure 4:** Compressed Air Engine

## 9. How Air Car Helps to Reduce Pollution

The most important pollutants in car exhaust include:

- Carbon monoxide (a piston) is formed because combustion is incomplete. Not enough oxygen is available fast enough to react with all of the carbon available.
- Nitrogen oxides – Because of the pressure and temperature inside a cylinder, nitrogen and oxygen in the air combine in various ways.
- Unburned hydrocarbons – not all of the hydrocarbons participate in the reaction because there is so little time available during the combustion phase.
- As about gasoline is the main source of pollution, if we used compressed air instead of gasoline then we can improve environment.
- As we know that nitrogen is the main constituent of environment, in case of air car we extract nitrogen from environment, liquefy it and used as fuel in car, then there will be nitrogen, only the exhaust gas which is not harmful to human being and environment. By using liquid nitrogen (compressed) in car, we can reduce pollution up to 70-80%.

## 10. Advantages of Air Car

- Refueling can be done at home using an air compressor or at service station. The energy required for compressing air is produced at large centralized plants, making it less costly and more effective to manage carbon emission than from individual vehicles.
- Compressed air engine reduce the cost of vehicle production by about 20%, because there is no need to build a cooling system, spark plugs, starter motor, or muffler.
- The rate of self-discharge is low opposed to batteries that depilate their charge slowly over time. Therefore the vehicle maybe left unused for longer periods of time than electric cars.
- Compressed-air vehicles emit few pollutants, mostly dust from brake and tire wear. Refueling can be done at home using an air compressor or at service station. The energy required for compressing air is produced at large centralized plants, making it less costly and more effective to manage carbon emission than from individual vehicles.
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- Compressed-air vehicles
- Lighter vehicles would result in less wear on roads.

## 11. Disadvantages of Air Car

- Refueling the compressed air container using a home or low-end conventional air compressor may take as long as 4 hours tough the specialized equipment at service station may fill the tanks only in 3 min.
- Tanks get warm when they filled rapidly. It would be difficult to cool the tank efficiently while charging and thus

it would either take a long time to fill the tank, or they would have to take less than a full charge(since heat drives up the pressure).

## 12. A Car That Run On Air, In India Soon

- **TATA MOTORS** has signed an agreement with **MOTOR DEVELOPMENT INTERNATIONAL** of **FRANCE** to develop a car that runs on compressed air, thus making it very economical to run and be almost totally pollution free.
- Although there is no official word on when the car will be commercially manufactured for **INDIA**, reports say that it will be sooner.
- The car could cost around **Rs 350,000** in **INDIA** and would have a range of around **300 km** between refuels. The cost of a refill would be about **Rs 90**.

## 13. Conclusion

For the entire disruption made one can say that by using air car there is reduction in air pollution. The emission benefits of introducing this zero emission technology are obvious. Also the aim of project is to cut cost, create job locally. Also air car provides an answer to the shortage of fuel and high price of fuel.

With petrol and diesel prices going up and the price of oil subjects to fluctuation for motorist, this will be shortage gasoline (petrol, diesel), in future, engine that runs on compressed air is only the alternative for it.

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