

## Air-Powered Cars

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### ABSTRACT

*This paper is reporting an experimental investigation of an engine driven by compressed air. The compressed-air engine is modified from a four-stroke working engine to two-stroke working engine (power and exhaust) by modification of cam-gear system. The project was successfully manufactured and tested. Experimental results were carried out on this modified engine to find out its performance characteristics like brake power, mechanical efficiency, indicated power, torque, etc. It should be noted that pressure higher than that currently employed can result in increased engine performance in terms of output power, torque and speed. The main advantage of this engine is that no hydrocarbon fuel is required, which means no combustion process is taking place. Thus the compressed-air vehicle will play an important role in reducing air pollution. Another benefit is that it uses air as fuel which is available abundantly in atmosphere. This study presents that atmospheric air in can be used in vehicles as the main or alternative source of power system.*

**Keywords:** *air-powered vehicles, alternative sources of energy, clean and highly efficient, compressed air, light weight, non-polluting*

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### INTRODUCTION

Air-powered car has the air kept under a pressure that is greater than the atmospheric pressure. It serves many domestic and industrial purposes. We know that the world is facing fuel crises. All kinds of conventional source of fuels are the verge of exhaustion. Gasoline, which has been the main source of fuel for history of cars, is becoming more expensive and impractical. These components in driving vehicle fabricate to manufacture auto-alternative fuel but the cost isn't just an issue with utilizing gasoline as an essential fuel. It is additionally harmful to the earth, and since it's anything but an inexhaustible asset, it

will inevitably run out. One conceivable option is the air-powered vehicles. It is difficult to trust that compressed air can be utilized to drive vehicles. Anyway that is valid and "air vehicles" have relevantly grabbed the eye of research around the world. It has zero emission and is perfect for city driving condition. MDI (Motor Development International) is one organization that holds the global license for compressed-air vehicle [1–3].

Compared to fuels like petrol and diesel, compressed air is favorable because of its high energy density, low toxicity, fast filling at low cost and long service life. These issues create difficulty in testing to

design air engines for all sorts of air-powered driven vehicles. To satisfy the developing need of open transportation, sustainable with ecological consciousness, individuals are looking for an alternative clean vehicle with zero emissions. Numerous ideas for such vehicles were suggested, everything from solar energy to green environment, but among them, most of them are costly and are hard-to-find fuels. Compressed-air vehicle project in the form of light utility vehicle (LUV) (i.e., air car in particular) has been a topic of great interest, and it is easy to design. Additionally, as talked about before, there is no combustion, which results in smooth working of the motor with least mileage. This will require less maintenance. Exhaust gases leaving the engine will be only air having low temperature. This will eliminate the problem of harmful emissions in conventional engines.

### **HOW COMPRESSED AIR CAN DRIVE A CAR**

Additionally, as talked about before, there is no burning, which results in smooth working of the motor with least mileage; this will require less maintenance. Exhaust gases leave the motor with air having low temperature. The simplest method to see this in real life is to blow up a balloon. The flexible skin of the balloon holds the air firmly inside, but when we use a pin to make a hole on balloon's surface, the air grows outward with so much energy that the balloon explodes. Compressing a gas into a little space is an approach to store energy. At the point when the gas extends once more, that energy is discharged to do work. That's the basic principle behind what makes an air car move [4, 5].

Air car will have air compressor built into it (Figure 1). After a brisk drive, we can take the car home, put it into the garage and plug in the compressor. The compressor will utilize air from around the

vehicle to refill the compressed air tank. But unfortunately, this is somewhat a moderate technique for refueling and will likely take up couple of minutes for a total refill. If this idea is worked, air refueling stations will accessible at common gas stores, where the tank can be refilled significantly more quickly with air that is already been compressed. Filling your tank at the station will most likely take around three minutes. This air vehicle will, in all likelihood, utilize compressed air motor (CAM) pneumatic wrench. Air car propelled with this engine will have tanks that will probably hold compressed air to about 11.03 bar pressure. Its accelerator operates a valve on its tank that enables air to be discharged into the hoses and after that into the engine, where the pressure of the air's expansion will push against the vanes and turn the rotor. This will deliver enough power for rates of around 50 km for every hour.

### **WORKING**

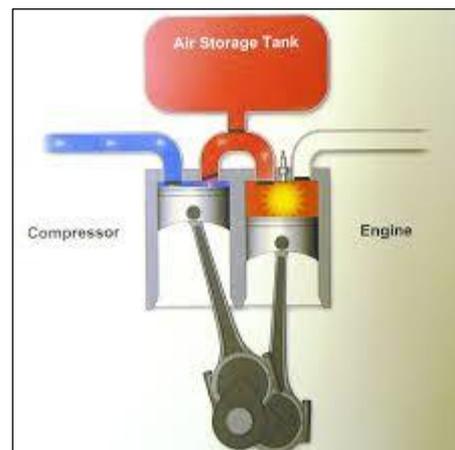
A compressed-air engine is a type of engine which converts mechanical work by expanding compressed air, where that engine is modified from four-stroke engine to two-stroke engine by changing the crank and cam shaft gear teeth. We have converted both the equal gear teeth. So, there are two-stroke inlet and exhaust. Pneumatic motor for the most parts convert compressed-air energy to mechanical work either into direct movement or rotatory movement. When compressed air is keep into the capacity tank, high-weight air is acquainted with the motor that pushes the cylinder and makes development.

The engine at that point changes over the air control into mechanical power. That power is then transferred to the wheels and makes it is run 50 km/hr, and it is appropriate for urban regions.



*Fig. 1. Air car.*

The motor that is introduced in a compressed-air vehicle utilizes compressed air which is put away in the vehicle's tank at a weight as high as 4500 psi. The innovation utilized via air vehicle motors is very surprising from the innovation which is utilized in regular fuel auto cars. Roughly 90 m<sup>3</sup> of compressed air is stored in fiber tanks in the vehicle. The motor is fueled by packed air, stored in a carbon-fiber tank at 30 MPa (4500 psi). The tank is made of carbon fiber so as to diminish its weight. The engine has injection similar to normal engines, but uses special crankshafts and pistons, which remain at the top dead centre for about 70° of the crankshaft's cycle; this allows more power to be developed in the engine. The expansion of this air pushes the pistons and creates movement. The atmospheric temperature is used to re-heat the engine and increase the road coverage. The cooling framework utilizes the removed cold air. Because of the unavailability of combustion and the result is no pollution, the oil change is just a necessary condition (Figure 2).



*Fig. 2. Working principle of compressed air engine.*



*Fig. 2. MDI car.*

### AIR-POWERED CAR IN INDIA

Tata Motors has signed an agreement with Moteur Development International of France to develop a car that runs on compressed air, thus making it very economical to run and 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 than later. The car – MiniCAT – 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. In the single energy mode, MDI cars consume around Rs. 45 every 100 km. Figure 3 shows the proposed air car for India. Being the smallest and the most innovative (three seats, minimal dimensions with the boot of a saloon), it is a great challenge for such a small car which runs on compressed air. The MiniCAT is the city car of the future.

### CONCLUSION

From the observation it can be concluded that compressed-air-power car can prove the future vehicles. This is a revolutionary engine design which is eco-friendly, pollution-free, but also very economical. This re-dresses both the problems of fuel crises and pollution. These are zero-emission vehicles. To sum it up, they are non-expensive cars that do not pollute and are easy to get around in cities. The conventional source of energy is limited due to that rate on price of petroleum also

continues to increase day by day. To satisfy these needs, an alternate energy is required. But while considering an alternate fuel, some factors are to be considered like availability, economy, environment friendly, etc., based on that CAT (Compressed-Air Technology) is the best technology which tends engine to zero pollutions. If further improvement is carried out with stress analysis, thermodynamic analysis, minimize compressed energy loss and other losses, then efficiency of CAE may further increase.

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