

## Study on Zero Pollution Air Powered Engine

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**Abstract** - The latest trend in the automotive industry is to develop light weight vehicles. Light utility vehicles are becoming very popular means of independent transportation for short distances. Every automotive industry is looking to reduce the weight of the vehicle as it helps in the better handling of the vehicle and increases the efficiency of the vehicle. Today, the heavy vehicles are run on the basically petrol & diesel, which producing a large amount of harmful gases like CO<sub>2</sub>, SO<sub>2</sub> etc. which act as the major source for global warming. The Cost and pollution with petrol & diesel vehicles is very high manufacturers to develop vehicles fueled by alternative energies. So, research is going on to find a light weight vehicle which does not pollute the environment. One of the alternatives is the use of compressed air to generate power to run an automobile. Due to the unique and environmentally friendly properties like compressed air for storing energy is a method that is not only efficient and clean, but also economical. So, the air is considered as one of the future fuels which will run the vehicles. This paper provides an overview of air power vehicles in brief and emphasizes the potential advantages and disadvantages of the compressed air technology. And assure that the compressed air is the alternative fuel for the vehicles.

**Key Words:** Air power, Engine, Compressed air engine, Zero pollution, Green technology

### 1. INTRODUCTION

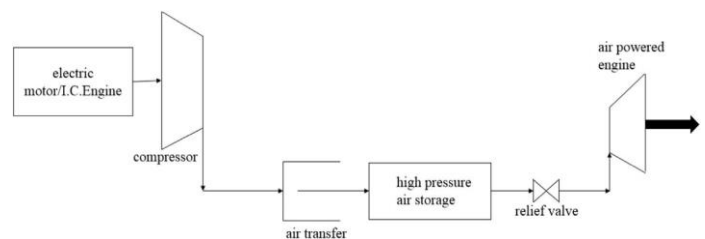
Compressed air is the air kept under a pressure that is greater than atmospheric pressure. It serves many domestic and industrial purposes. We know that our world is facing fuel crises now. All kinds of conventional source of fuels are the verge of exhaustion. While gasoline prices in the United States have not yet reach their highest point. But cost is not only problem with using gasoline as our primary fuel. It is also damaging to the environment, and since it is not a renewable resource, it will eventually run out. One possible alternative is the AIR POWER VEHICLES. It has zero emission and is ideal for city driving condition. MDI (Motor Development International) is one company that holds the international patents for compressed air car.

Compared to fuels like petrol and diesel, compressed air is favorable because of a high energy density, low toxicity, fast filling at low cost and long service life. These issues make it technically challenging to design air engines for all kind of compressed air driven vehicles.

### 1.1 Working Principle of Air Powered Vehicles

The principle of compressed-air propulsion is to pressurize the storage tank and then connect it to something very like a reciprocating steam engine of the vehicle.

Manufacturers claim to have designed engine that is 90 percent efficient. The air is compressed at pressure about 150 times the rate the air is pressurized into car tires or bicycle. A company has stated to store air in tanks at about 30 MPa and hold nearly 90 cubic meters) of air. The tanks may be refilled at a service station equipped with heat exchangers, or in a few hours at home or in parking lots, plugging the vehicle into an on-board compressor.



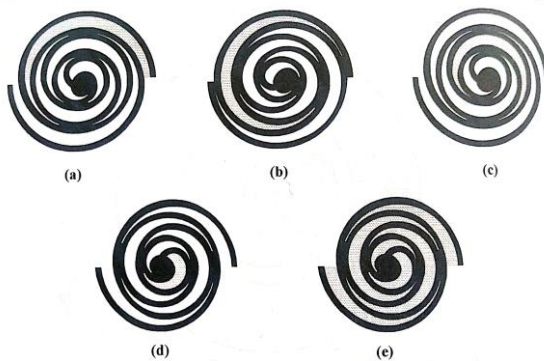
(Figure 1.1.1 Schematic of propulsion system of air powered vehicle)

### 1.2 Working

This engine works like a diesel engine. At the end of compression stroke, a very high-pressure air at room temperature is injected into the cylinder. Injection of air by electro-mechanical injection. System is governed by the cam dwell during which the piston also dwells. As the in cylinder hot and compressed air mixes with the externally injected relatively cold and compressed air, injected at relatively higher pressure than the inside pressure, the mixture tries to attain a common equilibrium temperature. As the temperature of this mixture falls down, expansion takes place. The high inside mixture pressure imparts a very heavy blow on the head of the piston, which is then set in motion and the engine runs. No combustion takes place; it is the expansive forces, which make the engine run.

### 2. Valve Timing Diagram for Air Powered Engine and Refilling Methods for Air Tanks

Figure 2.1 shows the motor used to compress air for air powered engine and its working.



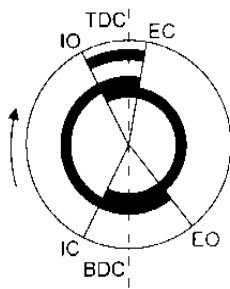
**Figure 2.1 Scroll Type Air Motor**

Inlet valve open: 10 degrees before TDC

Exhaust valve open: 20 degrees before BDC

Inlet valve close: 10 degrees after BDC

Exhaust valve close: 5 degrees after TDC Pressure of compressed air: 150 Psi RPM of crankshaft: 650-700 RPM.



**Figure 2.2 Valve Timing Diagram for Air Powered Engine**

Tanks are refilled by plugging the car into a main socket to feed the motor alternator which compresses the air with the motor compressor. Refiling time depends on source of electricity used. In near future, there may be service stations can refill car tank in 3 minutes.



**Figure 2.3 Refiling Station for Air Powered Car**

### 3. CONCLUSION

Compressed air for vehicle propulsion is already being explored and now air powered vehicles are being developed as a more fuel-efficient means of transportation. Some

automobile companies are further exploring compressed air hybrids and compressed fluids to store energy for vehicles which might point the way for the development of a cost-effective air powered vehicles design. Unfortunately, there are still serious problems to be sorted out before air powered vehicles become a reality for common use but there is a hope that with the development in science & technology well supported by the environmental conscious attitude and need to replace costly transportation methods, air-powered vehicles will definitely see the light of the day.

### REFERENCES

- [1] Venkatesh Boddapati, S.V.V.Vinod, M.Dora Babu, Air Powered Vehicle – An Eco-friendly Engine, International Journal of IT, Engineering and Applied Sciences Research (IJIEASR), Volume 4, No. 1, January 2015.
- [2] Sapkal Vishal K., Bhamare Punam A., Patil Tanvi P., Sayyad Munija S., Shrikant U. Gunjal, Future Trends In Automobiles : Air Powered Vehicles, International Journal of Advance Research In Science And Engineering (IJARSE), Volume No. 4, March 2015.
- [3] Lalit Patel, Dr. Ratnesh Sukla, Zero Pollution Air Powered Engine: A Review, International Journal for Scientific Research & Development, Volume 3, Issue 08, 2015.
- [4] Kripal Raj Mishra, Gaurav Sugandh, Study About Engine Operated By Compressed Air: A Pneumatic Power Source, ISOR-JMCE, ISSN No.:-2278-1684, Volume 2, Issue 6, Nov.-Dec. 14.
- [5] Saurabh Pathak, Kontham Shweta, V Shridhar, V.S.V. Prabhakar, Compressed Air Vehicle: A Review, ISSN: 2320-2092, Volume 2, Issue 04, April 2014.