

## Fabrication and Power Generation by Two Stroke Air Engine

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### ABSTRACT:

*This paper work deals with the Compressed-air engine as pneumatic actuator that converts one form of energy into another. The Air Driven Engine is an eco-friendly engine which operates with compressed air. This Engine uses the expansion of compressed air to drive the pistons of the engine. An Air Driven Engine is a pneumatic actuator that creates useful work by expanding compressed air.*

*There is no mixing of fuel with air as there is no combustion. An Air Driven Engine makes use of Compressed Air Technology for its operation The Compressed Air Technology is quite simple. If we compress normal air into a cylinder the air would hold some energy within it. This energy can be utilized for useful purposes. When this compressed air expands, the energy is released to do work. So this energy in compressed air can also be utilized to displace a piston.*

*Compressed air propulsion may also be incorporated in hybrid systems, 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. Current four strokes*

*single cylinder engine (bikes/moped) can be run on the compressed air with a few modifications that are the main objective of the study. Compressed air filled by electricity using a compressor.*

### INTRODUCTION:

In the past few decades, energy conservation and carbon reduction is an important issue in the World. Therefore, researchers have been searching for solutions to reduce carbon dioxide emission and improve fuel consumption. On the other hand, researchers have been also trying to find alternative energy sources like compressed air. Different kinds of engine integration or combination that uses green energy have been investigated to replace or assist conventional IC engines. These engines using green energy applications include electric engines, nature gasengines and air engines. In the recent years, some researchers proposed the utilization of compressed air engines that use compressed air as Power source in piston type engines which are similar to IC engines. Selecting piston type engine for compressed air operation has the advantage of easy adapting to conventional IC engines in the consideration of hybrid vehicles. At first glance the idea of running an engine on air seems to be too good to be true. Actually, if we can make use of air as an aid for running an engine it is a

fantastic idea. As we all know, air is all around us, it never runs out, it is non-polluting and it is free.

As there is no combustion taking place, there is no need for mixing fuel and air. Here compressed air is the fuel and it is directly fed into the piston cylinder arrangement. It simply expands inside the cylinder and does useful Work on the piston. This Work done on the piston provides sufficient Power to the crankshaft.

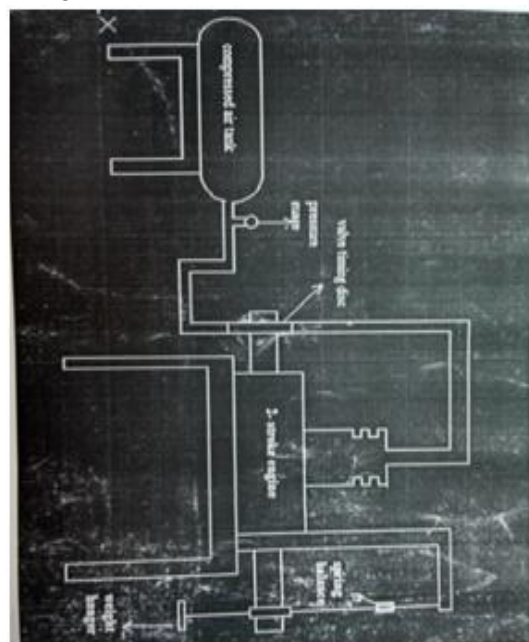
### Working Principle:

The principle behind the Working of the Air Powered Engine is the ability of air to store energy on compression and then release the same on expansion. On compression, the Work done by the pump gets stored as pressure energy. This compressed air is then stored in cylinders/tanks for later use. When this air is allowed to expand, the pressure energy of air gets converted to kinetic energy and causes propulsion. The same principle is used for engines. A throttling mechanism is attached to the cylinder opening valve from the throttle. When the required rotation is provided to the throttle, the valve opens to a particular degree controlling the amount of air delivered out. This air is delivered to the engine. When the compressed air enters the engine through the inlet valve it strikes the piston, Which moves (reciprocate) causing first half rotation of the crank shaft, this stroked air gets expanded Which then moves to the out through the outlet during the 2nd half rotation of the crank shaft . The air is stored either in cylinder or compressor. The sole purpose of storing air at such high pressure is to ensure that there is enough volume of air present in the vehicle to allow it to run for a long period of time before having to refill the cylinder.

### Construction:

- It consists of frame in which two stroke engine is mounted in it. Frame is provided to control the vibrations of engine while in running condition.
- Air compressor is provided to compress the air to required pressure and transfer this pressurised air to engine cylinder through hose pipes.

- The pressure gauge is fitted at the end compressor outlet to know the outlet air pressure.
- Hose pipes are provided to carry air from compressor to engine cylinder without any leakage. Two hose pipes are provided in which one is connected in between compressor outlet to pneumatic air gun inlet and another one is connected in between pneumatic air gun outlet to engine cylinder.
- Pneumatic air gun is provided to control the passage of air into the engine cylinder with the help of valve timing disc exactly above the valve timing disc. It is operated by means of rotation of valve timing disc.
- Valve timing disc is attached to crank shaft in which it exactly touches the handle of pneumatic air gun to allow the pressurised into the engine cylinder with perfect timing.
- Pulley is attached to crank shaft beside the valve timing disc to drive the dynamo through the belt.
- Belt is provided to transfer the mechanical Power from pulley to dynamo.
- Dynamo is welded to frame beneath the engine to generate the electrical Power.



**Fig.1 Construction of Compressed air engine.**

The procedure of compressed air engine is as follows:

- Firstly, the atmospheric air is entered into the compressor in which air is compressed to a required pressure. (Up to  $8 \text{ kg/cm}^2$ )
- The pressurised air is stored in the compressor storage tank up to  $8 \text{ kg/cm}^2$ .
- To start the engine initially crank is rotated manually and at the same time pressurised air enters into the engine cylinder then engine will start.
- When the engine is running the pressurised air flows from compressor outlet to engine cylinder through pneumatic air gun.
- Pneumatic air gun allows the air into engine cylinder with perfect timing as per engine cycles with the help of valve timing disc.
- Valve timing disc is rotated by means of crank shaft to operate pneumatic air gun automatically according to the engine cycles.
- Initially the piston is in rest position at Top Dead Centre (TDC).
- When the valve timing disc operates the pneumatic air gun trigger is actuated and then pressurised air enters into the engine cylinder at that time the piston moves from TDC to BDC. (Bottom Dead Centre)
- When the valve timing disc does not actuate the pneumatic air gun trigger, it does not allow the passage of air into the engine cylinder, then the piston moves from BDC to TDC with the help of crank rotation.
- When the piston moves from TDC to BDC Power is developed and this stroke is called Power stroke.
- The Power developed is being used in return stroke to move the piston from BDC to TDC is called exhaust stroke.
- When the engine is in running condition the crank is rotated continuously, the pulley which is attached to the crank shaft delivers the mechanical Power to the dynamo rotor.

- The dynamo which receives the mechanical Power, converts this mechanical Power into electrical Power by means of rotation of rotor.
- The electrical Power developed by dynamo is used for useful work.

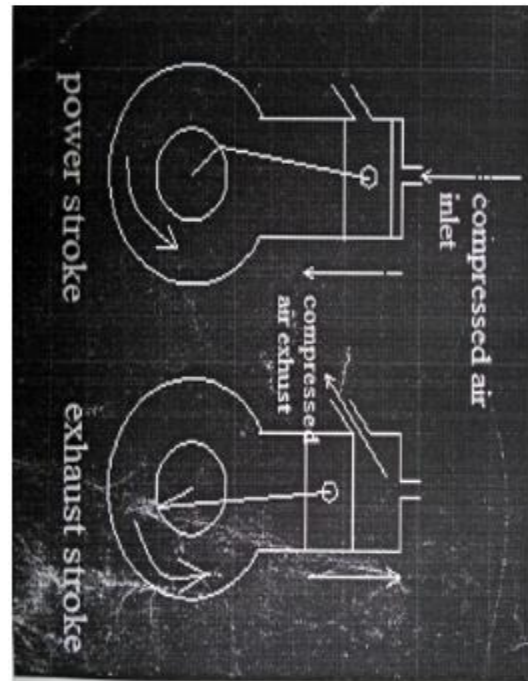


Fig.2 Working strokes of air engine

### Observations:

The tabulated readings are obtained from loading test procedure

Table No.1 Load testing calculations at various pressures:

Load $W_1$ (Kg)	No Load	0.5	1	1.5	2
Spring Balance Weight $W_2$ (Kg)	-	0.053	0.075	0.080	0.085
Pressure (Bar)	Varying Speed in rpm				
4.4	562.2	507	462	437	407.2
5	673.4	600.1	538.5	450	380.4
6	830.3	770	683	617	570
7.2	869.1	813	750	690	645



**Experimental setup:**



**Fig.1 (a) Experimental setup**



**Fig.4 (d) Experimental setup**



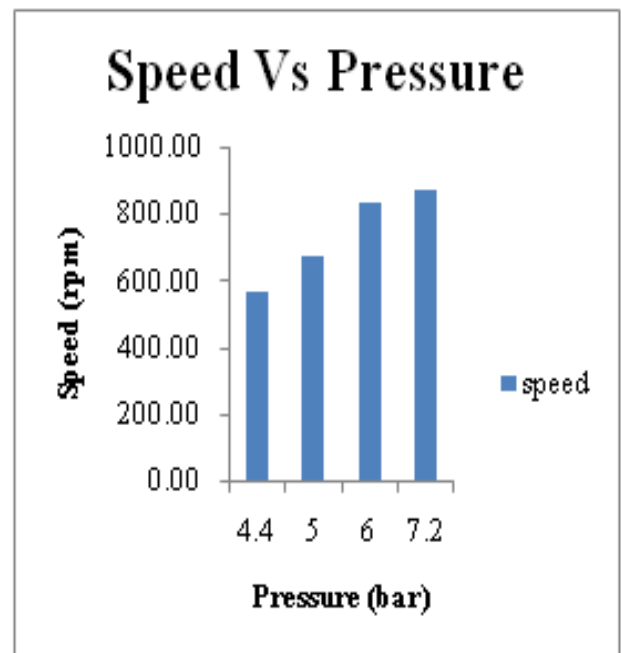
**Fig.2 (b) Experimental setup**



**Fig.3 (c) Experimental setup**

**RESULTS AND DISCUSSION:**

We successfully completed the modification of the two stroke petrol engine into the Compressed air engine. We can say that the cost of the modification is very less and the effective results can be achieved by comparing with other techniques like hybrid vehicle, electric vehicles etc. The compressed air engine is successfully modified and by conducting testing procedure best and optimum results are obtained. The obtained results are plotted in bar charts as follows.



**Chart.1**

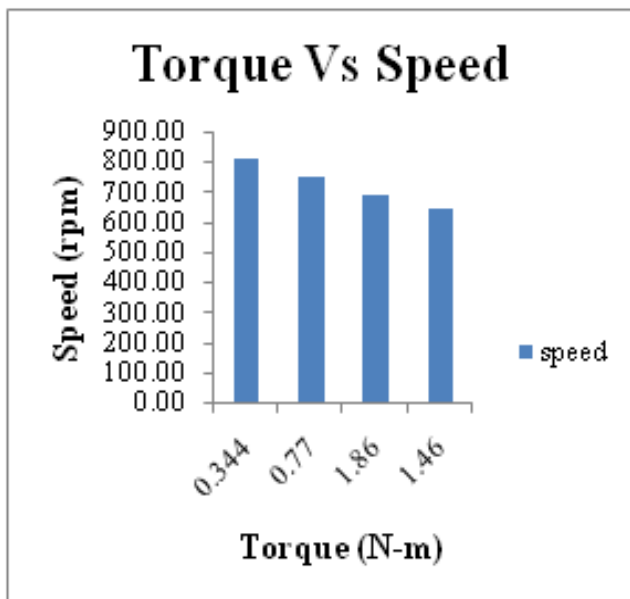


Chart.2

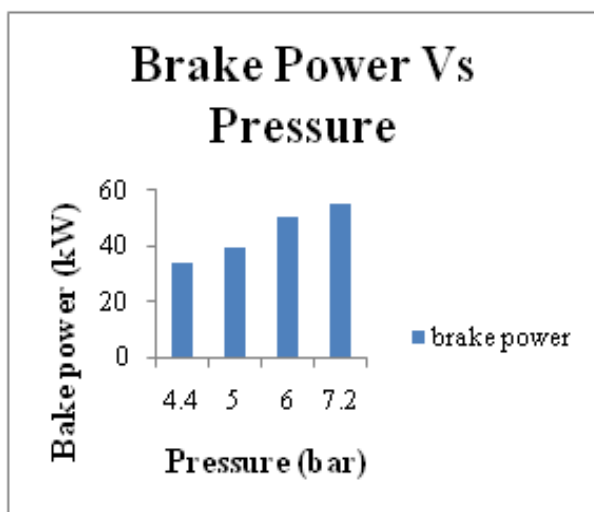


Chart:3

### CONCLUSION

On the whole, the technology is just about modifying the engine of any regular IC engine vehicle into an Air Powered Engine. The Air Powered Engine technology is cheaper in cost and maintenance, can be easily adapted by the masses and it doesn't cause any kind of harm to the environment. Instead, its widespread use will help mankind in controlling the serious problem of global warming. Future developments can be made by designing an ideal vehicle for this kind of engine. Efficient means of transportation.

### FUTURE SCOPE

- Design and fabrication of a new engine made of light metal will give better results.
- Usage of compressed air tanks for storage and supply will give it more scope in automobiles.
- Much like electrical vehicles, air Powered vehicles would ultimately be Powered through the electrical grid. This makes it easier to focus on reducing pollution from one source, as opposed to the millions of vehicles on the road. Transportation of the fuel would not be required due to drawing Power off the electrical grid. This presents significant cost benefits. Pollution created during fuel transportation would be eliminated.
- Compressed-air vehicles operate to a thermodynamic processes air cools down when expanding and heats up when being compressed.
- At the other end, the heat produced during compression can be stored in Water systems, physical or chemical systems and reused later.

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