Study and Development of Air Powered Vehicle Single Cylinder Two Stroke Engine a Review Study

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Abstract— This paper is reports on the air powered car for design and development of single cylinder engine which can be run by compressed air. The Air Driven Engine is an eco-friendly engine which operates with compressed air. An Air Driven Engine uses the expansion of compressed air to drive the pistons of an 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.

Key words: Stroke Engine, Air Powered Vehicle

I. INTRODUCTION

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.

An Air Driven Engine makes use of Compressed Air Technology for its operation. Compressed Air Technology is now widely preferred for research by different industries for developing different drives for different purposes. 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. This is the basic working principle of the Air Driven Engine. It uses the expansion of compressed air to drive the pistons of the engine. So an Air Driven Engine is basically a pneumatic actuator that creates useful work by expanding compressed air. This work provided by the air is utilized to supply power to the crankshaft of the engine.

In the case of an Air Driven Engine, there is no combustion taking place within the engine. So it is non-polluting and less dangerous. It requires lighter metal only since it does not have to withstand elevated temperatures.

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.

II. WORKING

Our air engine works on the same principle of that of an internal combustion engine. The only difference between the two is that in an internal combustion engine; the explosion of fuel in the combustion chamber produces the energy to move the piston, while in an air engine the energy for moving piston is acquired from the supplied compressed air. The complete assembly of our air engine consists of slightly modified ic engine, valve timing disc attached to the flywheel of the engine, sensor controlled valve mechanism, piping system, gauge system, air compressor and air tank.

Fig.1: Air Powered Engine

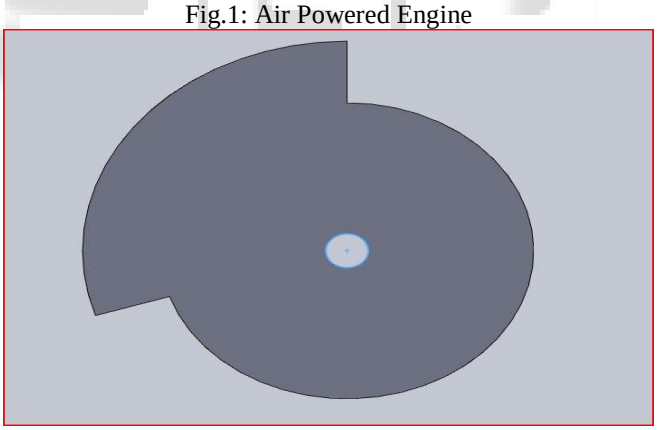

Fig. 2: Valve Timing

For the proper and continues working of the engine the timing with which the compressed air is supplied is of great importance. So in order to make it precise we used sensor controlled valve mechanism. The valve timing disc is made with utmost precision to precise operation of valve. For that the outer dead centre region (ODC) of the piston is found out and is marked on to the fixed valve timing disc. By the same method the point just before the exhaust port opening(EPO) is found out and marked on the disk with the help of a cross sectional change.

For starting; the engine is cranked by the kicker. This will rotate the crankshaft along with the valve timing disk in the clockwise direction. During this rotation the ODC region of the disc cuts the IR beam first and followed by the EPO region. When the IR beam is first cut by ODC

region, the circuit activates the solenoid valve by electric signal. At the moment the valve gets opened and allows the flow of compressed air into the cylinder from the tank through the piping system. The whole region from the point of ODC to EPO on the valve timing disk is opaque and does not allows the IR beam through it. So all the way long the circuit maintains the solenoid valve open by supplying a continuous supply of electric current to the valve. At the same time the compressed air from the tank continues to fill in the cylinder there by pushing the piston further towards the bottom dead centre (BDC). But to increase the fuel efficiency the fuel supply should be cut-off before reaching the EPO. So when the EPO region of the valve timing disc sweeps past away from between the IR sensors, the IR beam will make connection again. This will cut the supply to the solenoid valve there by closing the valve. This will prevent the valve from being open at the same time of EPO; increasing efficiency. When the disc rotates further, the valve remains closed throughout0 the area from the EPO to the ODC as the IR beam is closed. And this cycle continue.

III. COMPRESSED AIR TECHNOLOGY

Air can be compressed into small volumes and can be stored in suitable containers at high pressures. Such air compressed into containers is associated with an amount of energy. When the stored compressed air is released freely it expands thereby releasing the energy associated with it. This energy released can be utilized to provide useful work. The compression, storage and release of the air together are termed as the Compressed Air Technology. This technology has been utilized in different pneumatic systems. This technology has been undergoing several years of research to improve its applications.

Compressed air is regarded as the fourth utility, after electricity, natural gas, and water. Compressed air can be used in or for:

- Pneumatics, the use of pressurized gases to do work.
- Vehicular transportation using a compressed air vehicle
- Cooling using a vortex tube.
- Air brake (rail) systems
- Pneumatic air guns
- Pneumatic screwdrivers

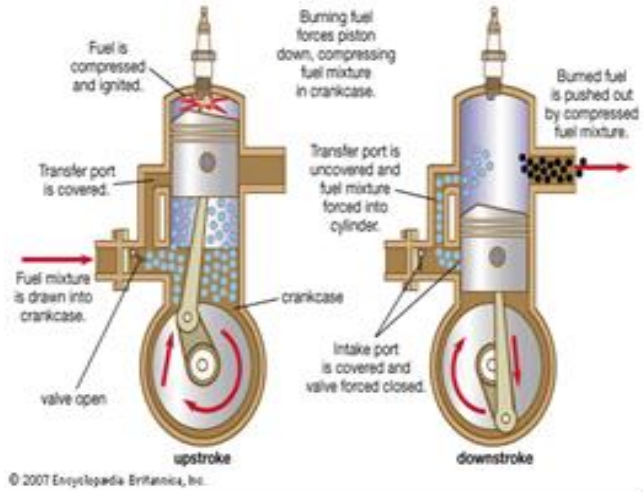

Fig. 3: CAT

IV. ADVANTAGES

- The air engine is an emission-free piston engine that uses compressed air as a source of energy.
- Simple in construction. The engine can be massively reduced in size
- Easy to maintain and repair.
- No fire hazard problem due to over loading. Air, on its own, is non-flammable.
- Low manufacture and maintenance costs
- Comparatively the operation cost is less.
- Light in weight and easy to handle. The engine runs on cold or warm air, so can be made of lower strength light weight material such as aluminum, plastic, low friction Teflon or a combination.
- Compressed-air tanks can be disposed of or recycled with less pollution than batteries.
- Compressed-air engines are unconstrained by the degradation problems associated with current battery systems.
- The air tank may be refilled more often and in less time than batteries can be recharged, with re-filling rates comparable to liquid fuels.
- Lighter vehicles cause less damage to roads
- The price of filling air tanks is significantly cheaper than petrol, diesel or biofuel. If electricity is cheap, then compressing air will also be relatively cheap
- Quick response is achieved.

V. PERFORMANCE CHARACTERISTIC

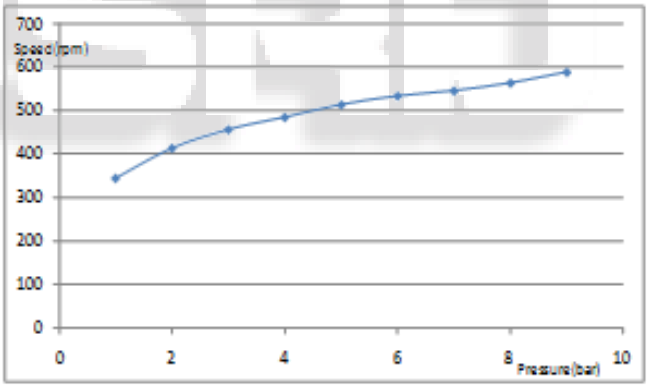

Fig. 4: Speed vs Pressure

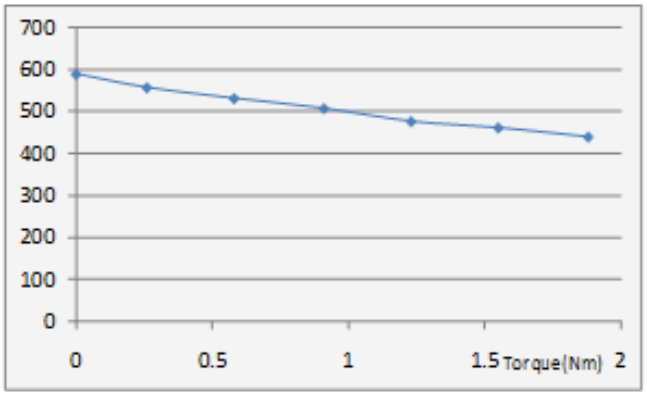

Fig. 5: Speed vs Torque

VI. APPLICATIONS

A. Drive for Conveyors

Air driven engines can be used as drives for different types of conveyors such as Belt conveyors, Chain conveyors, Screw conveyors, etc. it is normally used for slow speed conveyors. Medium load can only be used

Fig. 6: Belt Conveyor

B. Job Clamping

In operations like carpentry job clamping generally requires low loading. Air Driven Engine can provide this low load clamping.

C. Fluid Pumps

Air Driven Engine can also be utilized for small displacement pumps of low pressure capacities.

D. Automobiles

The usage of the Air Driven Engine is possible for automobiles as two wheelers and light motor vehicles.

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