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Review Article

A Review on Compressed Air Engine-Single Cylinder

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Abstract

This paper is review of single cylinder engine which can be run by the compressed air. Current four strokes single cylinder engine can be run on the compressed air with a few changes that are the main objective of the study. Compressed air is filled by electricity using a compressor. The electricity requirement for compressing air has to be considered while computing overall efficiency. Furthermore, the compressed air vehicle will contribute to reducing air pollution and tend to zero pollution level and promoting great environment. The main advantage of this engine is that no hydrocarbon fuel required and no combustion process is take place.

Keywords: *Compressed air, Single cylinder engine, Zero pollution level.*

1. Introduction

At a gleam, the idea of running an engine on air seems to be too good to be true. If we can make use of air as an aid for running an engine it is a great idea. We also know that air is all around us, it never runs out, it is free and it is non-polluting. An Air Driven Engine makes use of Compressed Air Technology for its working. Compressed Air Technology is widely preferred for research by different industries 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. When this compressed air expands, the energy is released for doing work. So this energy in compressed air can also be utilized to displace a piston. This is the basic principle of working of an Air Driven Engine. It uses 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 is provided by the air is utilized to supply power to the crankshaft of the engine. In case of an Air Driven Engine, there is no combustion taking place within the engine. So it is non-polluting and less harmful. It requires lighter metal only since it does not have to withstand elevated temperatures. As there is no combustion taking place, hence there is no need for mixing air and fuel. 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 enough power to the crankshaft.

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2. How Compressed Air Can Drive a Car

As we know that, the laws of physics state that free gases will fill any given space. A simple way to see this in action is to inflate a balloon. The elastic skin of the balloon holds the air tightly inside, but the moment you use a pin to create a hole in the balloon's surface. The air expands outward with so much energy that the balloon explodes. Compressing a gas into a small space is a way to store the energy. When the gas expands again, that energy is released to do work. This is the basic principle behind that makes an air car move. After a quick drive, we can take the car home, put it into the plug and garage in the compressor. The compressor will use air from around the car to refill the air tank. Unfortunately, this is a slow method of refueling and will probably take up few minutes for a complete refill. If the idea of an air car catches on, air refueling stations will become available at ordinary gas stations, where the tank can be refilled much more rapidly with air that is already been compressed. Filling your tank at the pump will probably take about three minutes. This air car will almost certainly use 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 allows air to be released into the hoses and then into the motor, where the pressure of the air's expansion will push against the vanes and turn the rotor. This will produce sufficient power for speeds of about 15-20 kilometers per hour.

3. Engine Working

High pressure air is introduced to the engine that pushes the piston and creates movement. The

atmospheric temperature is used to re-heat the engine and increase the road coverage. The air condition system makes use of the expelled cold air. There is no pollution, due to which oil change is necessary every 50,000 km.

Fig. 1: Four stroke engines convert into two stroke engine

Fig. shows the engine of CD100 bike. We convert the four stroke engine to two stroke engine by changing the cam and crank shaft gear teeth. We are converted both the equal gear teeth. So, there are two stoke inlet and exhaust.

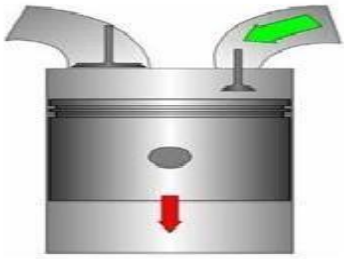

Fig. 2: Inlet of Air

Fig. 3: Outlet of Air

4. Review of previous research work

No more working on the single cylinder four stroke engine. But here few researches are outlined as given below related to compressed air engine. Air fuelled zero emission road transportation: A comparative study Haisheng Chen and oyhers adopted two technologies typical compressed air and liquid air power systems. Fig shows schematic diagram and working of cycle on temperature – entropy diagram for both the systems. As per author's knowledge only few works reported on this study.

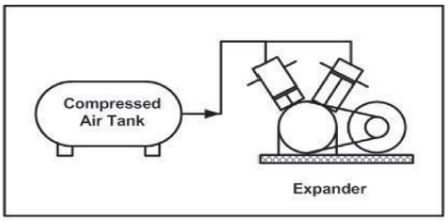

Fig. 7: Compressed air engine

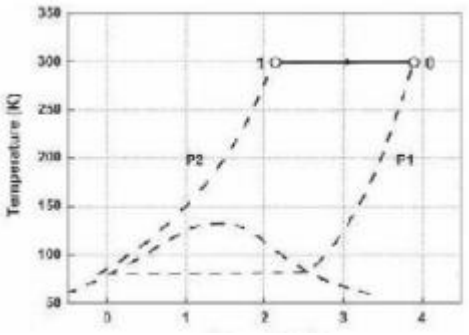

Fig. 8: T–S diagram of engines Compressed air engine.

Following conditions are used in the analyses Ambient pressure: P_1 = 1.013 bar. Working pressure: P_2 = 300 bar. Ambient temperature: T_0 = 300 K. Volume of tank: V = 300 lit. The reasons to consider a fuel tank with 300 lit Volume and 300 bar pressure include: 1. 300 l and 300 bar are technically feasible 2. A large volume and a High pressure are essential to give sufficient work output for an acceptable travel Distance and 3. Compressed air vehicles with a 300 lit fuel tank within initial pressure of 300 bar have been demonstrated practically. They have concluded in their paper is two types of air fuelled engines for zero emission road transportation are compared in terms of their shaft work, energy density and efficiency. It was found that the shaft work output given the working temperature and pressure, liquid air powered engines have a slightly lower specific work outputs than compressed air powered engines. At P = 300 bar and T = 300 K, the practical net work outputs of the compressed air engine for isothermal ties of γ= 0.75 and 0.90 are respectively 222.81 kJ/kg and 284.20 kJ/kg, whereas the corresponding values for the liquid air engines are 184.12 kJ/kg and 245.62 kJ/kg. The volumetric energy density of liquid air fuel is about 2.5 times that of compressed air fuel, and liquid air engines produce more coolth than compressed air engines. On the other hand, the efficiency of compressed air powered engine is higher than that of liquid air powered engines, mainly because of its high energy consumption of liquefaction plants. Their analyses also suggested that an effective use of coolth is key to improve the overall efficiency of liquid air powered engines. Air hybrid engines have different operational modes. The theoretical and experimental results showed the advantage of the proposed strategy over the

conventional single-storage system. The proposed compression algorithm can be utilized in air hybrid vehicle to increase the efficiency of energy recovery by the compression braking system. Compared to the double-stage regenerative braking, the double-tank system doubles the air flow rate because only one cylinder is needed to implement the proposed concept and due to this all the cylinders can be connected directly to the main tank. The proposed compression algorithm can be applied in air hybrid vehicle compression braking system as well as in any other applications, where higher pressure with higher air mass flow rate is demanded such as typical reciprocating compressors.

Future Scope

This review will explore the performance of Compressed Air Engine on the 4S single cylinder 100cc engine. As per our knowledge and percentage of success on work of Compressed Air Engine can be used in commercial bike, bicycle with a few modifications. That will help to minimize the pollutions level and dependency upon conventional source of energy and also be economical and become a new alternative for automotive purpose.

Following future scopes are possible of this project work.

– The same study can be investigated with new light-weight design of piston because of no combustion mean no thermal expect is considering in the design of piston, cylinder and other parts.

– The same study is carried out with other gases having more compressibility and more energy density.

– Engine is completely design for the compressed air– which omits the convectional parts like catalytic convertor, spark plug, engine fins, carburetor etc.

– Development is more consent on the storage– devices.

Conclusions

This days continue need of energy is increases. Basically conventional source of energy is limited due to that rate on price of petroleum is also increasing day by day. To fulfill their need, alternate fuel is required. But while considering alternate fuel some of factors are to be considered like availability, environment friendly and economy etc., based on that, Compressed Air Technology is best technology which tends engine to zero pollution. If further improvement is carried out with stress analysis, thermodynamic analysis, minimized compressed energy loss and other losses then efficiency of compressed air engine may be further increases.

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