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Compressed Air Engine: Future -Environment Friendly Transportation- A Review

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***Abstract*- Global warming is the major problem to be faced by the world today. One of the main factors contributing is the emissions from vehicles i.e. vehicles owned by common people are the Major cause of global warming. Internal combustion engine produces a large amount of harmful gases like CO2, SO2 etc. Which pollute the environment and it consumes enormous non-renewable energy. So today every country is in search of alternative source of energy and there are couple of alternate sources of energy such as solar power, tidal power, geo-thermal power, etc. and one of them is compressed air .A compressed-air vehicle is powered by an air engine, using compressed air, which is stored in a tank. However, the main advantage of this engine is that no hydrocarbon fuel is required that means no combustion process is taking place, thus the compressed air vehicle will play important role in reducing air pollution.**

Key Words- Compressed air, vehicles, and engine.

I. INTRODUCTION

Over the recent decades, the serious environmental issues, such as greenhouse effect and ozone layer depletion have drawn considerable attention. Burning of fossil fuels has been considered as the main contributor of carbon emission which causes some serious environment issues.
The idea of using compressed air as a fuel source for running an engine, seems too good to be true. But actually, it is a fantastic idea as air is abundantly available, it is non-polluting and it is free.
As a replacement for conventional IC engines which leads to carbon emission, researchers have studied several types of engines that use green energy to determine the feasibilities of these engines to be used in Automobiles. The examples included are electric engines, natural gas engines, and hydrogen engines. They are most common and widely used. A hybrid electric engine consists of two power sources, which are conventional IC engine and an electric motor, that can be operated separately or integrated to provide power output. Due to the power integration in hybrid electric engines, they are complicated in the transmission design and prove to be expensive. There are some disadvantages of electric engines that they require heavy batteries and slow recharge rate. In past few years, high pressure compressed air has been considered a green energy source for its advantage of zero carbon emissions and potential applications as a main or auxiliary power system in Automobiles. Compressed air technology has many potential advantages like in this technology we use air as fuel and its exhaust air is pure as well as its exhaust temperature is also less than ambient temperature, here the only pollution source is the process of compressed air generation.
As air is inexhaustible resource, once the demand for compressed air increases the cost for the same will reduce significantly. Hence, compressed air powered car can prove to be the environment-friendly vehicle of the next decade.

II. LITERATURE REVIEW

In various different fields, fossil fuels are widely used as a source of energy. Depletion of these fossil fuels is happening at a faster rate, due to its tremendous use and its limited stock on earth. So, as there will be a shortage of fossil fuels it is very important to conserve these energies. One of the major fields in which fossil fuels are used in an internal combustion engine.

In general, sustainability can be stated as; meeting the needs of current and future generations through simultaneous environmental, socio-economic improvement of the energy resources to preserve the oil and make brighter future of mankind by adding alternative energy sources such as non-conventional and or renewable energy which is going to help the current problem to some extent.
The core dynamic system of the air-powered engine is the compressed air. It is a kind of device which generates power by converting the compressed air energy into mechanical energy by expanding. The compressed air converted by the piston into mechanical energy. The mechanical energy is then transferred to the wheels through chain sprocket mechanism and used to operate the vehicle. Atmospheric air acts like a blanket for the earth. It is a mixture of gasses, which makes it neutral and non-polluting. It has the property to get compressed to very high pressure and retain it for a long period of time. It can be used as an alternative fuel for automobiles as it is abundantly found in the atmosphere and hence it's cheap as well.

III. FUTURE SCOPE

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Airpod – The Mini Car.

In collaboration with India's Tata Motors and Paris based Air France, an alternative fuel vehicle (Air pod) was developed by Motor Development International. It works on the compressed air. The Airpod's engine works with the help of two linked cylinders. The manufacturing of these plants has been set up in Sardinia, Italy and it will be available in India soon.

It is a 220-kilogram car with an energy supply of 350 bars, which is 80 kg of air compressed to 350 times sea-level atmospheric pressure. It is a tiny three-seater car. As a pneumatic jackhammer does to blast apart concrete, the engine of Airpod converts the air into mechanical energy. The current version of this car has a maximum top speed of 45 km per hr. It has a feather-like a joystick to move around. This is the product of Motor Development International (MDI), a company registered in Luxembourg, a palmy industrial suburb of Nice, France. The father and son team behind MDI (Guy and Cyril Nègre), have a prediction that their technology will find mass appeal in the emerging city-car category, an automotive segment of small, efficient cars well suited for crowded European and Asian cities and not meant for long trips and is not ready for heavy-duty vehicles.

In future, the solar energy can also be used to produce electricity for the air to be compressed at the initial stage which will also reduce the use of coal and burning of it, which causes tremendous carbon emission.

IV. OBJECTIVES

The main objective is to reduce carbon emission due to the burning of fossil fuels.

In various different fields, fossil fuels are widely used as a source of energy. Depletion of these fossil fuels is happening at a faster rate, due to its tremendous use and its limited stock on earth. So, as there will be a shortage of fossil fuels it is very important to conserve these energies. One of the major fields in which fossil fuels are used in an internal combustion engine. And to minimize its use an alternative of IC Engine is "Compressed Air Powered Vehicle". It is the vehicle which uses compressed air to run Engine.

V. WORKING

Compressed air engine works as the high pressure compressed air is introduced to the engine and the piston converts the pneumatic energy into mechanical energy.

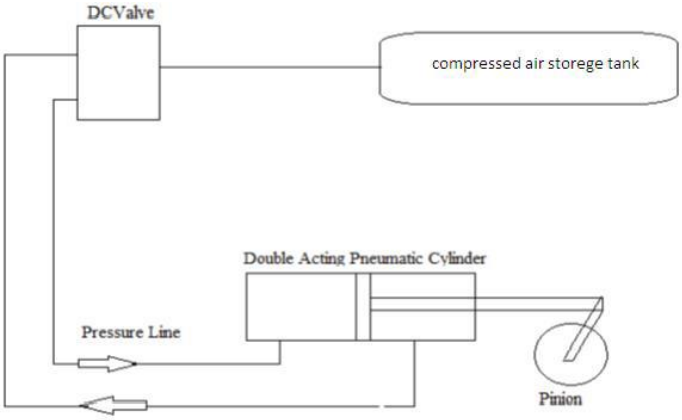

Figure .1. Schematic diagram of compressed air engine

The air is stored in a compressed air storage tank which is regulated by a DC valve through pressure lines to the pneumatic cylinder which converts the pneumatic power to mechanical power, which then is given to the transmission system and then to the wheels.

Fig. 1: Inlet of Air

Fig. 2: Outlet of Air

VI. ADVANTAGES

(1) Compressed –air vehicles are comparable in many ways to electric vehicles, but energy is stored as compressed air instead of batteries. Their potential advantages over conventional vehicles include.

(2) The production cost is reduced by 20% by using compressed air technology because there is no need to build a cooling system, fuel tank, ignition system or silencers.

(3) The size of the engine can be massively reduced as it has a simple design to construct.

(4) It has Low manufacturing cost and as there is no carbon residual the maintenance costs is also less and feasible.

(5) The Compressed –air storage tanks can be easily disposed of or recycled with less pollution compared to batteries.

(6) As it does not emit toxic gases such as CO2 & SO2, it is environment friendly and as it is a Lighter vehicle it causes less damage to roads, resulting in lower maintenance cost.

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VII. DISADVANTAGES

(1) The storage tank refueling of compressed air vehicle using a home or a low-end conventional air compressor may take as long as 4 hours tough the specialized equipment at a service station
it may take 3 min to fill the tank.
(2) Tanks get warm when they filled rapidly. The filling of the tank should be done at a slow rate or it might lead to overheating of the tank or they would have to do fill the tank at a lesser amount than full charging(since heat drives up the pressure).
(3) Only limited storage capacity of the tanks. So, we cannot opt for a long drive.

I. CONCLUSION

As compressed air is environment friendly in nature, it is important to note that even if vehicles running on compressed air is a distant dream, they still have public interest. The technology of 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. From the observation, it can be concluded that compressed air power vehicles can prove to the future vehicles which are eco-friendly, pollution-free, but also very economical. This points out both the problems of fuel crises and pollution. These are zero-emission vehicle.

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