



An Experimental Investigation on Compressed Air Engine Test Rig

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ABSTRACT

This project will describe the working of a four-stroke single cylinder Engine which can run on pneumatic power as by compressed air. Since it is an old technique which can attract many scientist as well as Engineer's for many years. This project will describe on the same with some new modification which is main objective of this project. Since engine is operated by Compressed air which contribute to reduce the air pollution and tend to zero pollution level of atmosphere and making a great a environment. While developing it some parameters as like temperature, density, input power, emission control will be mastered for development of safety. Since the Gasoline is a thing of past so the main advantage of CAE is no hydrocarbon fuel is required i.e. No combustion process is occur there.

KEYWORDS : Pneumatic motor, Storage tank, Compressed air engine, Emission output, Eco friendly, CAE

Introduction

Today fossil fuels are widely used as a source of energy in various different fields like power plants, internal & external combustion engines, as heat source in manufacturing industries, etc. But its stock is very limited, fossil fuels are depleting at faster rate. So, in this World of energy crisis, it is inevitable to develop alternative technologies to use renewable energy sources, so that fossil fuels can be conserved. One of the major fields in which fossil fuels are used is Internal Combustion Engine. An alternative of IC Engine is "AIR POWERED ENGINE". Here compressed air will be used to run the engine. It is cheap as it uses air as fuel, which is widely available in atmosphere. There are several technical benefits of using this engine, like as no combustion takes place inside the cylinder, working temperature of engine is very close to ambient temperature. This helps in reducing Wear and tear of the engine components. This in turn results in smooth working of engine. There will not be any need for installing cooling system or complex fuel injection systems. This makes the design simpler. This adds value to its economic benefits

In other hand reason behind compressed air technology is as we know Fossil fuel which fills the energy production demand polluting our ecosystem due to which greenhouse effect, ozone layer depletion, acid rains and air pollution takes place. This can be reduce and controlled by using compressed air engine.

Current Scenario:

Now days we are using I.C engine like S.I and C.I engines in automobile in which petrol or diesel is used as fuel and this cycle is complete in four stroke suction, compression, power and Exhausts. Exhausts from these engines leads to many environmental disasters like Global warming, Acid rain Green House effect, ozone depletion directly and indirectly. Here due to friction some power loss takes place in reduce in mechanical efficiency. And also required cooling and lubrication system which made this engine complicated

Motive of project:

As mentioned above the recent automobiles have become slaves of the fossil fuel. There are many problems like environment disasters price rise and scarcity of fossil fuels tends us to go towards alternative fuel. Many alternative fuels are used in automobile but they are complicated to produce and time consuming. Thus we are going for the easily obtainable fuel which is compressed air. It is economical fuel. The main motive of this project is to design and implement a car eco friendly, zero exhaust and emission, economically cost effective using easily obtainable fuel.

Why compressed air is selected

- Hear compressed air is used as fuel because of air is widely available in nature and its zero pollution and cost of the compressed air is very less compared to other alternative fuels like HYDROGEN, SOLAR, BIO-GAS and ETHANOL and BIODIESAL.
- Solar energy also used as alternative fuel but the manufacturing cost and maintenance cost is higher compared to CAF. In CAF no need to any kind of complex circuit and costly panel like solar system. And CAF is not depends on atmospheric condition like solar system, so we can say that air is used as alternative fuel is more suitable than solar energy.

- Now if we talk about hydrogen so first of all its very costly process to produce hydrogen and also very dangerous to store and it's highly flammable and it is chance to blast if leaked. So compared to hydrogen CAF is very safe and no chance of blast in any condition and also economic to produce compressed air.
- Now if we compare CAF with ethanol, Ethanol can absorb water & if water enters the fuel tank and water dilutes ethanol, reducing its value as a fuel. It causes problems with corrosion. So ethanol is not suitable in India because of its weather condition. Aldehyde a function of ethanol volume is a threat to nose, eyes, and throat & possibly causes cancer. CAF is non toxic fuel and not harmful to the human health and not absorb water in side it so our engine will also safe during running.
- So we have decided used AIR as fuel for our engine because of its vary economic, safe and widely available at every where

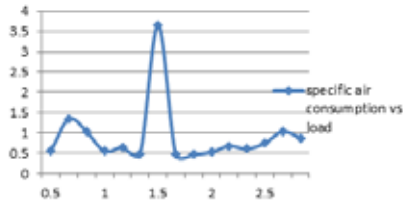
Practical approach

In CAV compressed air is used as fuel high pressure air is stored in cylinder at 140 kg/cm². One pressure regulator valve is used to regulate pressure which supply constant pressure from the cylinder to the engine. Here pressure drop takes place in intake manifold of conventional engine so I have reduced intake manifold pipe and put on nozzle which gives efficient work. One end of tube is connected with regulator out let and other end is connected with nozzle inlet

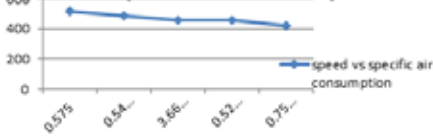
Observation table

pre- pressure	load in kg	speed in rpm	Initial weight of cyl- inder in kg	Final weight of cyl- inder in kg	Mass flow rate(kg/ min)	Break pow- er(KW)	specific air consumption (kg/kw*mim)
1	0.5	520	60.280	60.165	0.115	0.2	0.575
		510	60.165	59.900	0.265	0.196	1.352040816
		508	59.900	59.700	0.2	0.195	1.025641026
		485	59.700	59.495	0.205	0.373	0.549597855
		480	59.495	59.240	0.255	0.396	0.643939394
	480	59.240	59.045	57.100	1.945	0.531	0.492424242
6	1.5	460	59.045	57.100	1.945	0.531	3.662900188
		465	58.000	57.750	0.25	0.533	0.469043152
		459	57.750	57.500	0.25	0.53	0.471698113
	455	57.500	57.130	56.660	0.47	0.701	0.527817404
2	450	57.130	56.660	56.240	0.42	0.693	0.678210678
		422	56.240	55.630	0.61	0.812	0.606060606
	2.5	425	55.630	54.780	0.85	0.818	0.751231527
2.5	420	55.630	54.780	54.070	0.71	0.808	1.039119804
		420	54.780	54.070	0.71	0.808	0.878712871

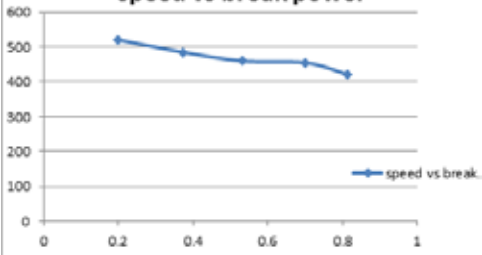
specific air consumption vs load



speed vs specific air consumption



speed vs break power



Conclusion

We have successfully completed the design and fabrication of the Air Driven Engine. By doing this project we are able to find out different parameters of air engine which is able to run light duty vehicle this technology is still in under research so we can find different method for improvement in CAE

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