

# Development and Experimental Investigation of Four stroke Compressed Air Engine

**Dr. Sanjay S. Bhagwat**

Associate Professor,

Mechanical Engineering Department,

Babasaheb Naik College of Engineering, Pusad, (MS) INDIA

**Abstract-** 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 an alternative fuel. Many of the alternative fuel by products hazardous and the production and preparation of many alternative fuels are complicated. Thus we go for an easily obtainable alternate fuel, compressed air. Other than that it is economically beneficial to us compressed air. The main motive of the paper to study and implement a eco friendly engine, with zero exhaust and emission, economically cost effective using easily available air.

**Keywords-** Compressed Air, Zero Exhaust Emission.

## I-INTRODUCTION

Conventional energy sources which meet most of the world's energy demand today are on the way of depletion. Also combustion product of these sources causing problems like pollution, greenhouse effect and ozone layer depletion. To avoid human being from hazardous effect of these sources engineers are trying to develop such vehicle which cause less harm to human being and also to the environment. In result of that, hybrid vehicles, electric cars and air car are the new born child of this technology which is more efficient and less harmful.

Using potential energy stored in compressed air for running engines and propelling vehicles can be developing to be clean and best alternative. Instead of going to development of a whole new pneumatic system to run the engine, which requires high capital cost and research. The solution on this that making modifications in existing four stroke petrol engine and make it suitable for compressed air so it can run on compressed air.

Compressed air engine is emerging technology and can be implemented in future cars.<sup>(3)</sup>

## II-WORKING PRINCIPLE

The basic principle of compressed air engine is slightly different from the engines which runs on gasoline fuel. In petrol engines, petrol burns itself & produces in the gases which are used to move the piston cylinder arrangement same principle is used in compressed air engine but instead of using petrol only compressed air is used to displacement of piston. The compressed air tank is the energy storage medium similar to a fuel tank in gasoline operated vehicles. Compressed air tank is used to supply necessary amount of air to the engine which is required for engine operation to run the vehicle efficiently. Density of fuel used will be high but in fact compressed air is having less energy density as compressed to conventional fuels & rechargeable batteries. Various gas laws explain how compressed air behaves. Boyle's law state that if volume of air halves during compression then pressure is doubled. Also, Charles law state that volume of gas changes in direct proportion to temperature. So according to this laws compressed air is used to run the engine by thermodynamic expansion.[1]

## III- EXPERIMENTAL SET UP

The experiments are carried out by varying load conditions over HERO HONDA CD 100 engine to study performance characteristics of the engine.

Table 1 : Technical Specification Of Engine

No. of cylinder	Single cylinder
Displacement	97.22 cc
Bore diameter	50 mm

Stroke length	49.5 mm
No. of stroke	4 strokes
No. of gears	4 speed gear
Maximum power	5.44 kW @ 8000rpm
Maximum torque	0.79 kgm @ 5000 rpm

For conversion of petrol engine into compressed air engine necessary modification in timing gear and cam shaft has been done. The experimental setup as shown in Fig 1 and it consist of various components like engine, compressor, non-returned valve, pressure gauge, dynamometer, air supply pipe, etc.



Fig 1: Experimental Setup Of Compressed Air Engine

#### IV- RESULT AND DISCUSSION

The variation of torque with pressure has been found as per Fig 2. As supplied pressure increases torque also increases because supplied pressure exerts force on piston head which is responsible for reciprocating motion of piston which results in a rotation of crank shaft.

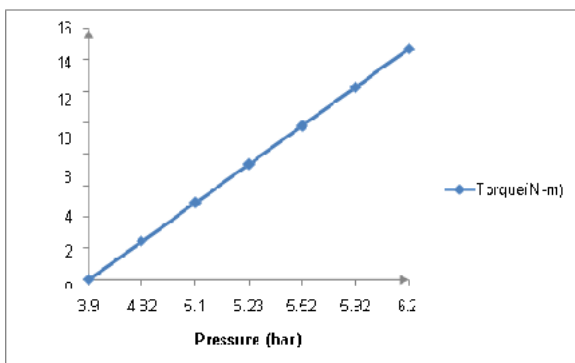


Fig 2: Variation of torque with pressure

Fig 3 represents variation of brake power with load. As load increases brake power also increases because brake power is directly proportional to torque and torque is proportional to load.

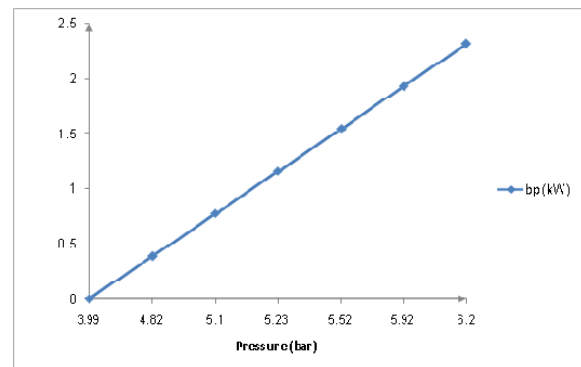


Fig 3: Variation of brake power with pressure

The variation of indicated power with load has been found to be as per Fig 4. At initial condition when supplied pressure is low, brake power is zero and engine shows some indicated power inside cylinder.

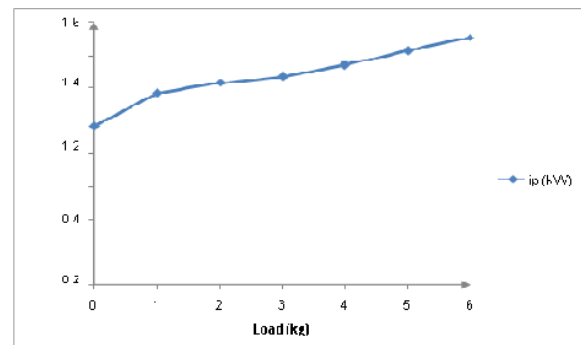


Fig 4: Variation of indicated power with pressure

#### V-CONCLUSION

From above experimental study and performance analysis of compressed air engine, the Compressed air technology allows us to use engines that are both non-polluting and economical. After few years of research and development, the compressed air vehicle will be introduced worldwide. Unlike electric or hydrogen powered vehicles, compressed air vehicles are not expensive and do not have a limited driving range. Compressed air vehicles are affordable and have a performance rate that stands up to current standards. The emission benefits of introducing this zero emission technology are obvious. At the same time the well to wheels efficiency of these vehicles need to be improved. Improved efficiency and dynamic performance may be obtained with indepth study with the numerical simulation model which is more realistic such as including the effect of changing the state of stored air, the heat transfer, and the more detailed loss functions.

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