

# Compressed Air Operating Vehicle For Industrial Purpose

<sup>#1</sup>Prof.S.Darewar, <sup>#2</sup>Kripashankar Upadhayay, <sup>#3</sup>Jaysurya Supekar,  
<sup>#4</sup>Mangesh Patil

<sup>3</sup>jaysuryasupekar@gmail.com



<sup>#1</sup>Assistant Professor, Department of mechanical Engineering  
<sup>#234</sup>Students, Department of Mechanical Engineering

P.E.S Modern College of Engineering, Pune.

## ABSTRACT

A compressed air operating vehicle is powered by compressed air stored in the tank. It uses the expansion of air to drive the piston instead of mixing air with fuel and driving piston with hot expanding gases as in conventional I.C. engine. Air power technology for the mobility is reviewed in the context of mechanism used and their working principle for compressed air powered engines. Latest trend in the automotive industry is to develop more environmental friendly vehicles. One of the alternative is the use of compressed air to generate power to run an automobile. Due to unique properties of air, it is considered as future fuel which will run the vehicle.

**Keywords – Compressed air, pneumatic cylinder, Frame**

## ARTICLE INFO

### Article History

Received: 4<sup>th</sup> June 2019

Received in revised form :  
4<sup>th</sup> June 2019

Accepted: 6<sup>th</sup> June 2019

**Published online :**

**6<sup>th</sup> June 2019**

## I. INTRODUCTION

In a pneumatic system, the working fluid is a gas (mostly air) which is compressed above atmospheric pressure to impart pressure energy to the molecules. This stored pressure potential is converted to a suitable mechanical work in an appropriate controlled sequence using control valves and actuators. Conversion of various combinations of motions like rotary-rotary, linear-rotary and linear-linear is possible. The simplicity in design, durability and compact size of pneumatic systems make them well suited for mobile applications. Pneumatic control system plays very important role in industrial system owing to the advantages of low cost, easy maintenance, cleanliness, readily available, and cheap source, etc.,. A particularly well suited application for vehicle operating on compressed air is material handling and for visitors in industry.

Compressed air storage energy (CASE) is a promising method of energy storage, with high efficiency and environmental friendliness. Compressed air is regarded as fourth utility, after electricity, natural gas, water and the facilitating production activities in industrial environment.

Unfortunately production of compressed air solely for pneumatic vehicle is not affordable but in manufacturing industries compressed air is widely used for many applications such as cooling, drying, actuating and removing metal chips. In addition, as a form of energy, compressed air

represents no fire or explosion hazards; as the most natural substances, it is clean and safe and regarded as totally green. The performance of air car is explain in which the importance of the impact of the fossil fuels in the present and future generations is explained which led them to design a new vehicle which runs by renewable energy sources. Compressed air vehicle are more suitable for low speed, short range and flammable environment.

## II. PROBLEM STATEMENT

1. Reduction of environmental pollution.
2. Make simple structure of vehicle.
3. Use of conventional energy sources.
4. Change of mechanism.

### A. OBJECTIVES

- To control the emission.
- To save the non-renewable sources of energy.
- In IC engine replace piston by using double acting cylinder.
- To reduce the vehicle weight by changing components

### III. CONSTRUCTION

The major components of compressed air operating vehicle include:

- a) Frame
- c) Tire
- d) Transmission system
- e) Compressed Air Storage Tank

#### Working of the setup

Working of setup consists following:

1) Compressed air operating vehicle- The working of the compressed air powered vehicle is similar to the conventional vehicle the only change in the engine. In conventional vehicle double acting cylinder used where as in compressed air powered vehicle double acting cylinder is used. Also in conventional vehicle there will the fuel tank where as in compressed air powered vehicle air storage tank is used.

2) Double acting cylinder- Pneumatic cylinders or air cylinders are mechanical devices which use the power of compressed air to produce a force in a reciprocating linear motion or cylinders which converts pneumatic power into mechanical power. Compressed air forces the piston to move in the desired direction. As the operating fluid is air, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement. Because air is expandable substance, it is dangerous to use pneumatic cylinder at high pressure so they are limited to 8 bar (gauge) pressure.

3) Working of 5/2 DCV valve- Pneumatic cylinder is hard to control precisely. The force exerted by the compressed air moves the piston in two directions in a double acting cylinder. These are used particularly when the piston is required to perform the work not only in the forward movement but also on the return. In principle, the stroke length is unlimited, although buckling and bending must be considered before we select particular size of piston diameter, rod length and stroke length Second position - In second position. the pressurized air is supplied to the piston rod end through port P, B causing the piston to retract. During the retraction the air present at the piston side is forced out through port Q.



Fig 1: Basic design of Compressed air operating vehicle

### IV. SPECIFICATIONS

Serial Number	Component	Values
1	Double acting pneumatic cylinder	Bore = 20 mm Stroke length= 80 mm Volume =25132 mm <sup>3</sup>
2	Sprocket design	Chain no.06B Z=18, Pitch(P)= 9.525mm Width bet. Inner plates =5.72 mm Roller diameter = 6.35mm Transverse pitch = 10.24mm



Fig 2: Compressed air operating vehicle

### V. CONCLUSION

1. This method explores effective application of pneumatic power. Pneumatic vehicle will replace the battery operated vehicles used in industries. Pneumatic powered vehicles requires very less time for refueling as compared to battery operated vehicle.
2. On the whole, the technology is just about modifying the engine of any regular IC engine vehicle into an Air powered engine.
3. The air powered technology can be easily adapted by the masses and it doesn't cause any kind of harm to the environment.
4. At the end of this review we can conclude that compressed air technology can be tested and developed using the vane type noval air turbine as there are minimal losses and practically their efficiency varies from 72-97% which is very high compared to conventional IC engine.

### REFERENCES

1. Mistry Manish K, Dr. Pravin, P.Rathod, Prof. Sorathiya Arvind S, "STUDY AND DEVELOPMENT OF COMPRESSED AIR ENGINESINGLE CYLINDER: A REVIEW STUDY", IJAET/ Volulme .III/ Issue I/January-March, 2012/271-274

2. Singh B.R. and Singh Onkar, 2008, ENERGY STORAGE SYSTEM TO MEET CHALLENGES OF 21ST CENTURY- AN OVERVIEW-ALL INDIA SEMINAR ON ENERGY MANAGEMENT IN PERSPECTIVE OF INDIAN SCENARIO-held on October 17-19, 2008 at Institution of Engineer (India), State Centre, Engineer's Bhawan, Lucknow-Proceedings Chapter 15, pp 157-167.
3. Prof. B. S. Patel, R S BAROT, KARAN SHAH, PUSHPENDRA SHARMA, "AIR POWERED ENGINE" National Conference on Recent Trends in Engineering & Technology-B.V.M. Engineering College, V.V.Nagar, Gujarat, India, 13-14 May 2011
4. Gorla, R., and Reddy, S., 2005, Probabilistic Heat Transfer and Structural Analysis of Turbine Blade, IJTJE, Vol. 22, pp 1- 11.
5. S.S.Verma, "AIR POWERED VEHICLES", The Open Fuels & Energy Science Journal, 2008, Volume 1, pp.54-56.
6. Rose Robert, William J. Vincent, 2004, Fuel Cell Vehicle World Survey 2003-Break through Technologies Institute, February' 2004, Washington, D.C.
7. J.Prabakaran, K.Kannan, S.Gopal, S.Palanisamy , International Journal of Science, Engineering and Technology Research (IJSETR) Experimental Investigation of Mechanical Properties of Basalt Fiber Reinforced Vinylester Composites , Volume 3, Issue 12, December 2014
8. C.Y. Yuan. T. Zhang, A. Rangarajan, D.Dornfeld, B. Ziemba, R. Whitbeck, A decision-based analysis of compressed air usage patterns in automotive manufacturing, Journal of Manufacturing System, 25 (4) (2006), 293-300.
9. Cox R. Compressed air- clean energy in a green world, Glass Int. 19(2) (1996), F. Reuleaux, W. Kennedy; Kinematics of Machinery, 268, (1876), pp. 335.
10. S R Majumdar, Pneumatic system (principles and maintenance, Tata McGraw-Hill Education, (1996), Technology & Engineering – 282.
11. A.Addala&S.Gangada, Fabrication and Testing of Compressed Air Car, Global Journal of Researches in Engineering Mechanical and Mechanics Engineering, 13(1), (2013), 1-9.
12. A. Papsion, F. Creutzig, L. Schipper, Compressed air vehicles: a drive cycle analysis of vehicle performance, environmental impacts, and economic costs, 2010 Annual meeting of the transportation research board and publication in the transportation research record.
13. S.S. Verma, Air Powered Vehicles, The Open Fuels & Energy Science Journal, (2008)1, 54-56.