



Design and Fabrication of an Air Compressed Engine

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ABSTRACT

Petroleum and crude oil products are expected to become scarce and expensive in his century, and fossil fuels are quickly decreasing. Conventional engine technology contributes significantly to the global warming challenge. Compressed air engine (C.A.E.) is one of several potential solutions to this problem that could be considered a boon. It's safe for the environment, less expensive, and readily available. It is only able to run on highly pressured air as a source of energy. Concerns about emissions from (conventional) gasoline and diesel engines are another driving force for the development of alternative fuels for (IC) engines. Because there is no combustion process with this technology, there is no heated and dangerous exhaust like there is in a diesel or gasoline engine. Compressed air technology is employed in the operation of an Air Driven Engine. Using the Compressed air technology is a breeze. It works by compressing air into a cylinder, which stores energy inside the air. This power can be put to good use. Expansion of compressed air releases energy for beneficial purposes. Compressed air has energy that can be used to move a piston.

Keywords: *Internal-Combustion Engine, Compressed Air, Non-renewable energy, Conventional Engine*

INTRODUCTION:

An increase in the rate of energy use today poses numerous dangers to people and the environment. Researchers, engineers, scientists, and environmentalists from all around the world have made significant progress toward reducing this problem, but not all of these efforts have been implemented in our physical surroundings. Compressed air-powered vehicles, which potentially reduce many of the risks, have yet to be fully studied. [1] Compared to other types of engines that use fossil fuels, compressed air engines produce less pollution, are lighter, require less maintenance, and are less expensive to produce. An internal combustion engine is being converted to run on compressed air as part of the compressed air engine project.

Mine locomotives have been powered by compressed air since the nineteenth century, and naval torpedoes were propelled by compressed air before that. The "engines" lack of torque is a key flaw in this vehicle. The costs of compressing air for use in a vehicle are much lower than those of a conventional internal combustion engine. Abundant and non-polluting air can be moved around easily and stored in a wide variety of places. [2] Vehicle production costs are slashed by 20% since compressed air technology eliminates the need for a refrigeration system, a fuel tank, spark plugs, or mufflers. Inert gases, such as air, have no ignition source.



Fig. 1 Air car by H. K. Porter Company in 18th century

An air compressor will be included into the air car. Our automobile is ready to go home after a quick test drive. We only need to hook up the compressor. In order to replenish the compressed air tank, the compressor will draw fresh air from the surrounding area. Aside from the fact that it will take a few minutes to refill, this method of recharging is fairly slow. [3] If the concept of an air car takes off, gas stations will be able to offer air refuelling stations, which will allow the tank to be replenished much more quickly with compressed air. You should expect to spend roughly three minutes filling up your tank at the pump.

Working Of Compressed Air Vehicle

An air compressor is used to first compress the air needed for the compressed air wheel to operate. Compressing atmospheric air is done by using an air compressor [1 atmosphere=1.013 bar]. As needed, the engine receives compressed air from a tank of compressed air. The tank has a pressure gauge attached to it that measures the cylinder's internal pressure. The air gun functions as a flow control valve by supplying compressed air from the storage to the motor. [4] To turn the pressure energy of air into circular motion, a pneumatic motor with a rotary actuator is employed. The motor's torque capacity falls short of what we need, necessitating the addition of a worm and worm wheel gearbox. An important aspect of the design is the use of a worm and worm-wheel gear. Using a single gazing worm, a smaller spur gear with axes set at 90 degrees to one another may still rotate the worm 360 degrees. Only one tooth of the gear wheel is moved by the worm wheel. A mechanical mechanism, the gearbox boosts the engine's power. At one end, the motor shaft is connected to the gearbox's internal gear arrangement, which provides output force and determines a vehicle's top speed by the gear ratio. It is joined to the shaft with worm and worm wheel gears, which increase the torque power of the motor, resulting in a more powerful wheel movement when the gear arrangement chain drive is connected. [5] Wheels are rear members of power transmission devices through which wheels move on the road surface and drive the vehicle. They are in direct touch with the road surface.

Review of Literature

In the compressed air automobile, Anirudh Addala et al. [6] examined the use of compressed air as a working medium. In order to produce the power to weight ratio of 0.0373kW/kg, he built his own model. Many R&D organisations around the world are still conducting various types of research.

For the vehicle to move itself, it does not require the usage of fossil fuels, which is detailed by B.R. Singh et al [7]. His main focus is on the use of compressed air to start the engine, which he claims is more efficient than other methods. Compressed air is being harnessed in the design of a new engine.

In the words of Vishwajeet Singh- People are always looking for ways to power their machines that are both environmentally friendly and efficient. We've been able to make things simpler thanks to recent advances in lightweight, strong materials. Compressed air was used to power a 4 stroke engine that had been converted to a 2 stroke configuration. [8]

In this case, Saurabh Pathak One of the primary causes of global warming is the emissions from heavy automobiles, which emit massive amount of gases like CO₂, SO₂, and sulphate of carbon. In order to discover a vehicle that is both environmentally friendly and minimal in weight, researchers are now working on this. In order to power an automobile, one approach is to use compressed air as a power source. [9]

In the name of Pramod Kumar. J-. [10] Compressed air is used to turn a SI engine into a working compressed air engine. Because of its simplicity of design, a four-stroke single-cylinder SI engine can be converted to a two-stroke engine that runs on compressed air.

Prof. B.S. Patel et al. [11] have been tried to produce a compressed air-powered engine have been made by replacing the spark plug with a pulsed pressure control valve, which can generate the necessary pressure. Because an electrical signal is now used to control the valve, an electronic timing circuit was suggested. This allows the engine's speed to be controlled by an electrical signal as well.

Objectives

- To lessen the impact on industries that use internal combustion engines.
- The use of unconventional energy to reduce the consumption of conventional energy.
- Compared to automated graded vehicles that can be used in industry for material handling, compressed air vehicles' speed is superior.
- The use of a compressed air engine to reduce emissions from internal combustion engines.
- Compressed air vehicle design and construction to increase the vehicle's carrying capacity.

Research Methodology

Commonly, the term "research" refers to the pursuit of information, but the scientific and systematic character of the search material can also be used to define the term. Literature review was used to gather secondary data in this study It is the goal of this paper to provide readers with a thorough understanding of the topic, its significance, and the literature supporting it.

Result and Discussion

The table below compares the fuel economy and CO₂ emissions reductions of various vehicle types. [12]

Table 1. Comparative study of types of vehicle

Comparison of several types of green car basic characteristics (Values are overall for vehicles in current production and may differ between types)				
Type of vehicle/ power train	Fuel economy (mpg equivalent)	Range	Production cost for given range	Reduction in CO ₂ compared to conventional
Conventional ICE	10-78	Long (400-600 mi)	Low	0%
Biodiesel	18-71	Long (360-540 mi)	Low	100%
All-electric	battery	Shorter (73-150 mi)	High	varies
Compressed air	30-60	380 mi	Medium	100 %

The speed vs. pressure graph is depicted in the image below. As depicted in the image, the engine's speed increases as the pressure in the compressed engine rises.

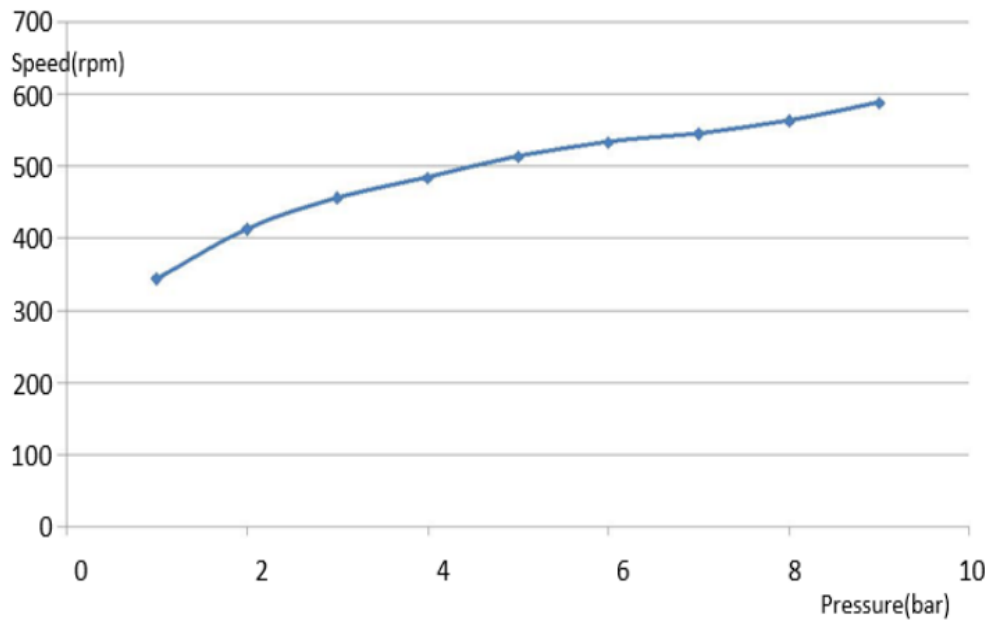


Fig. 2 Speed vs pressure

In this system, compressed air is kept in a tank before being supplied into the engine. A piston will be positioned on a spring inside the air chamber. Expansion of the chamber's pressurised air causes the piston to be pushed down by its own weight. [13]

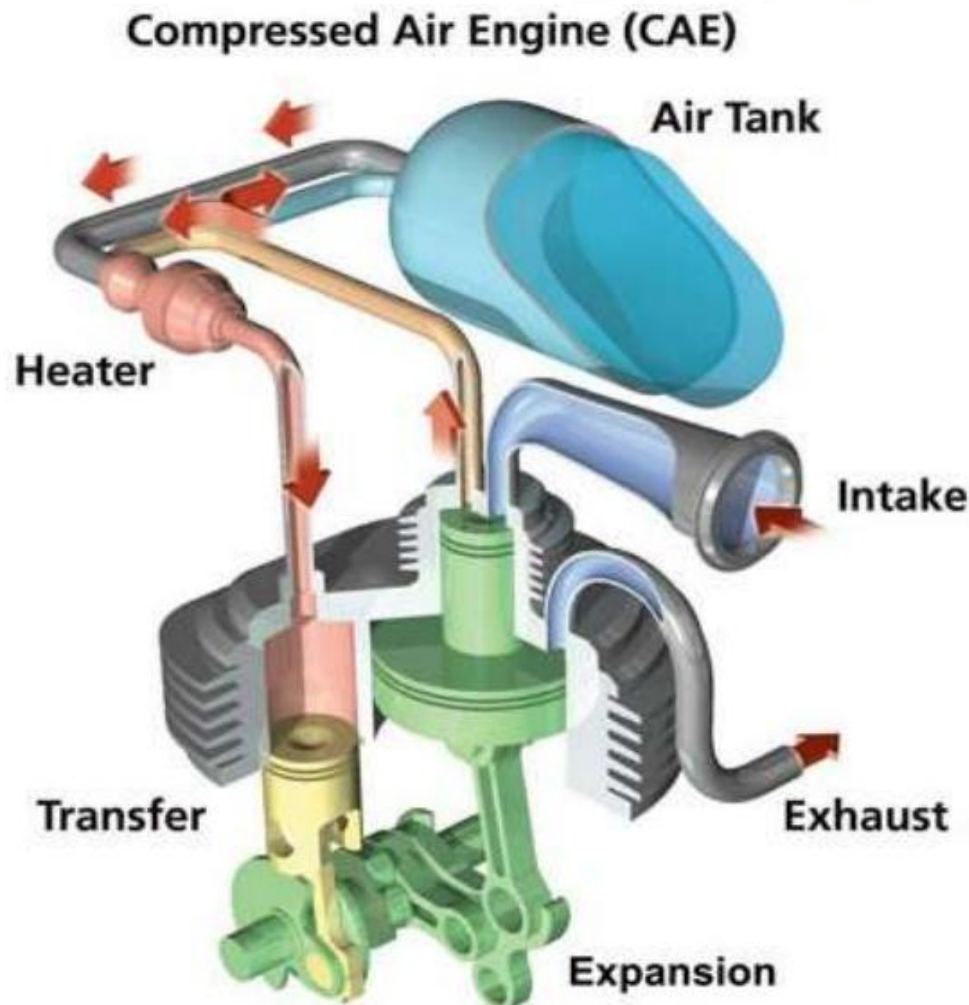


Fig. 3 Compressed air engine

As a result, the spring will be sucked in. Force on the piston's top will be zero when air escapes the chamber, allowing the spring to raise the piston. In this manner, the piston will begin to move back and forth. [14] Crankshaft rotation is made easier by the reciprocating piston. A compressed air engine is depicted in Fig. 3.

Conclusion

Developing a carbon fibre tank that can withstand high pressure while taking up minimal volume of space is critical if we are to gain widespread acceptance and produce no harmful emissions. CAE is the implementation of innovative automotive technology. This includes the development of a compressed air-powered or multi-fuel engine that can run on either air or fuel. To move further in this area of vehicle technology, we need to expand our research and development into the use of compressed air as a fuel source. As a result, we will develop and build a vehicle model that is environmentally friendly and does not contribute to pollution. The internal combustion engine is to blame for much of the world's warming trend and other environmental problems. Compressed air vehicles use ambient air as a source of power instead of fossil fuels. Everyone nowadays will focus on alternative energy sources. The compressed air vehicle could be a key element in the development of future technologies that reduces the consumption of natural resources.

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