International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 05 | May - 2022 Impact Factor: 7.185 ISSN: 2582-3930

Pneumatic Air Engine for Automobile Application

Jaykumar Patil, Digvijay Patil, Swapnil Bobe, Kishor Biradar, Prof. N. K. Nath

JSPM's Rajarshi Shahu College of Engineering, Tathwade

SPPU Pune, India

ABSTRACT

Mankind is constantly seeking out an green and pollutant-loose manner of powering machine. Some sure experiments have been achieved at the reshape engine to have a look at the effectiveness of this engine. Compressed air as an electric starter in various general uses and as a non-polluting fuel in pneumatically powered automobiles has intrigued scientists and engineers for ages. Many developers and manufacturers are working to capture the era of pneumatic vehicles in every aspect to use it for the first time in the world. The current article offers a quick creation with modern features of a pneumatic vehicle in conjunction with an creation to diverse problems related to the era and their solution. When developing pneumatic cars, manage pneumatic parameters such as temperature, power density, requirements of power, power launch and emission manage should be mastered for the improvement of a safe, mild and cost effective compressed air automobile in close to future.

KEYWORDS: Pneumatic technology, Valve, Compressed air tank, Heating wire.

INTRODUCTION

The depletion of fossil fuels and the current sharp increase in gasoline prices have forced researchers to find alternative energy sources to fossil fuels. Some offer new advanced electric, hybrid and pneumatic propulsion (CAE) concepts. A pneumatic motor is a type of engine that uses the generation of compressed air to produce beneficial work. The concept is to store compressed air in a container. The compressed air in the tank has a very large capacity and this capacity can be used to transport the piston of the engine. The back and forth movement of pistons in engine cylinders has a beneficial effect on technology.

History and experimentation

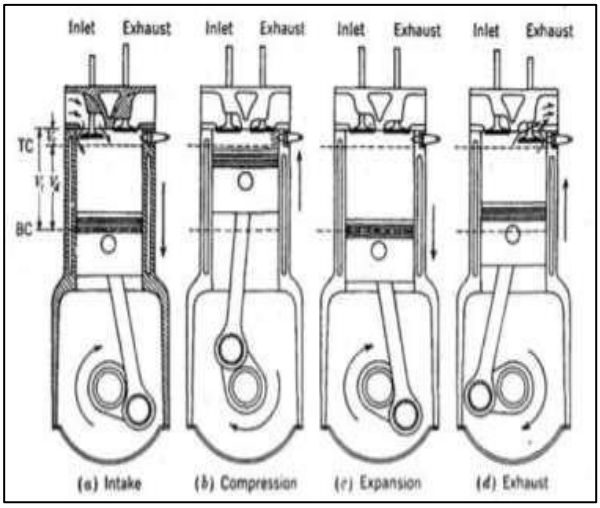
The records of Compressed Air Technology (CAT) aren't always new to industries. Pneumatic strain saved in tanks with the usage of CAT has been used to power many pneumatic primarily based totally gadgets in industries . The use of CAT did now no longer continue

to be to simply commercial utility however has been additionally carried out for using the automobile. CAT was first used to operate a means of transport in the 18th century (Mishra'Sugandh, 2014 , p.99). CAE energy is used to power a train crossing the Nantes tramway in France (Mishra'Sugandh , 2014 , p.99). The use of CAT to power the engine no longer achieves much traction due to a number of technological hazards and the availability of gasoline. However, Charles B.. Hodges now no longer only invented a vehicle to be powered with the aid of using a compressed air engine however additionally carried out fulfillment in locating excellent use for commercial industries (Mistry Manish K, Rathod, Arvind, 2012, p. 271) .Charles' work on CAE has added an opportunity to apply CAE on small cars.In 2002 an engine with degree become advanced with the aid of using Motor Development International (MDI) to without problems suit inside a industrial vehicle (Thipse, 2008). This engine overcame many of the dangers of the early CAE engine and became more efficient in its operation. The engine advanced with the aid of using MDI additionally has a more price of torque when in comparison with early CAE engine. In addition, the Indian engine giant TATA has introduced production of CAE-powered vehicles, which is expected to be available to consumers immediately in 2018 (Lampton, p.4). The work on the modern-day CAE nonetheless want to triumph over a few dangers of recharging the compressed air tank. Big cannakers are nonetheless looking ahead to a few important improvement withinside the CAE primarily based totally vehicle earlier than placing their hand withinside the manufacturing of such vehicle.

Results and discussion

Parts of CAE:

A new era Compressed Air Engine include pretty engineered components to make sure clean running and excessive efficiency. The layout of CAE includes compressed air tank, throttling valve, piston engine and exhaust tail. The vehicle may have an built in compressor so one can use the encircling air to fill up the compressed air tank (Lampton, p. 4). Compressed air tanks can be a very important part of a CAE. A compressed air reservoir is a field containing compressed air of relative pressure. Thus, a compressed air reservoir acts as a power supply for the CAE and is responsible for driving the piston engine (Lampton, p. L).The internal force of a compressed air tank comes from air with a decent pressure.However, The increase in weight of the terrain is not favorable even for the design of a car. Compressed air in a compact container is not easy to obtain, even considering the reduced weight of the car (Edelstein, 2015, p.36). It is important to construct a field with better power to preserve such high cost of stress. One such answer is growing the thickness of the field walls. Increasing the thickness can supply the structural power to field, however on the equal time it will increase the load of the field. The growth in weight of the field isn't favorable even as designing a car. The compressed air isn't smooth to shop in compact vessel even as thinking about the weight loss of car (Edelstein, 2015, p. 2). Thus, it may take some excessively energetic materials to design a field (or compressed air vessel) , that is simultaneously light. According to LeGault (2012) "The better modulus and fracture toughness provided by the silica-filled epoxy/carbon fiber composite allows for a much lighter tank configuration but with more capacity in the same area" (p. 4). A tank manufactured from carbon fiber will assist in fending off the chance of busting through giving great power and at equal time it is going to be lighter in weight.



Carbon fiber compressed air tanks may have an outlet, which passes through the throttle valves, which connects to the engine inlet. A motor is a device that converts some form of electrical energy into beneficial work output. The main engine layout consisted of a piston, an engine cylinder, a fixed inlet and outlet valve, and a crankshaft. means increase the air" (p. 99). Similar to a traditional engine, a pneumatic engine uses the stress of the air stored in the compressed air reservoir as the gas to provide the necessary stress for the piston to move. According to Lampton (n.d.)"compressing a fueloline right into a small area is a manner to keep power, while the fueloline expands again, that power is launched to do work" (p. 1). A throttle is provided between the compressed air tank and the air motor to control the amount of air entering the engine from the compressed air reservoir.When the intake valve opens, the engine will come into direct contact with compressed air stored inside the tank. Excess air enters the engine chamber to grow. According to Thipse (2008) , "Compressed air growth drives pistons to create motion , regulate fossil gasoline combustion in traditional engines" (p.34). Pneumatic growth takes up space while the engine piston is at TDC. The compressed air appearing at the floor of piston head ends in the improvement of excessive stress at the piston head.The quite Pressurized air is introduced into the engine chamber which pushes the piston and induces piston movement from TDC to BDC (Manish, Rathod, Arvind, 2012). This simple system keeps the engine running clean and greenAn engine for business manufacturing want to be green with excessive energy output. Today's buyers need a vehicle that best suits their budget, but has the same power as traditional cars.This may be simplest performed via way of means of enjoyable essential standards of the customers: If the strength required to energy the automobile is without problems

to be had and is cheaper.The vehicle need to have excessive energy and torque.. A CAE meets key customer standards favorably because it uses normal ambient air as the fuel to run the engine. The air is around us to a considerable extent and is also separated as mentioned above. In addition, the second requirement of car buyers is energy and engine efficiency to make the required paints.An engine is best Graded through its performance. An engine is usually as compared with different engine primarily based totally on its performance. The efficiency of the motor determines the amount of power it can produce for an incoming amount of power. The electrical efficiency of CAE can be given because the ratio of the output power generated by the motor to the power input is realized in the motor (Yu & # 38; Cai , 2015 , p.147). Therefore, after efficiently fueling the CAE with less expensive electricity, the second one vital undertaking become to attain better strength output from the compressed air.The primary item of the use of compressed air generation is to attain a much better labor intensive production cost for input power (as compressed air) is much less than CAE (Mishra & Sugandh,2014, p. 100). The actual energy of the motor can be determined more efficiently by empirical claims and mathematical calculations. A test version designed by CAE shows that once the throttle is opened to allow a large amount of compressed air into the engine chamber, this results in faster car speeds at the top torque value. (Wang, You, Sung, & # 38; Hang , 2014 , p.. 64). This thus provides experimental evidence that the CAE has much higher paint torque than traditional engines. However, the torque generated by the CAE continues to decrease with the decrease in pressure in the compressed air tank. So a compressed air wants to win over such a drawback. On September 15, 2004, Di Pietro launched a brand new CAE configuration which he claims is 100% greener than any other CAE to date and torque output becomes much higher. to strengthen a vehicle (Hanlon, 2004, para. 1). This development has so far provided an opportunity for automakers looking for a better opportunity to bolster their vehicles with an engine that has won the oil crises while, at the same time, standing out as a greener source of energy.

Overview of this paper

The literature review provides a brief introduction to the development of CAE; it solves the problem of leakage and inefficiencies that can be faced even with CAE additive design and how to overcome them.Further,it additionally covers the blessings of the usage of CAE in lowering the strength crises and reducing the worldwide warming. However, the idea of walking the automobile the use of CAE nevertheless want a few awareness in growing infrastructure to strength the automobile.This paper came up with the idea of a direct upgrade of a conventional internal combustion engine to a 2-stroke using compressed air technology formed the basis of my CAE testing and discussed its benefits and offers insight into the development fate of CAE.

TESTING RESULTS

Test	1
Date	01-07-2022
Test condition	1) Air pressure in manifold is: 150pi 2) Without coolant 3) Without engine oil 4) Without spark plug 5) Engine started manually normal weather
Modification	No modification
Results	Engine just took only one stroke and stopped automatically

Test	2
Date	01-12-2022
Test condition	1) Inlet compressed air pressure: 150 psi 2) No coolant was used 3) No engine oil was used 4) No spark plug was used 5) Engine was manually started 6) Normal weather conditions
Modification	Inlet and outlet valve was modified by reducing the stiffness of the inlet and outlet valve spring
Results	1) Cool air was coming at the exhaust outlet 2) Engine was started and was running successfully

Test	3
Date	01-16-2022
Test condition	1) Inlet compressed air pressure: 120 psi 2) No coolant was used 3) No engine oil was used 4) No spark plug was used 5) Engine was manually started 6) Normal weather conditions
Modification	The compressed air pressure was reduced from 150psi to 120 psi
Results	1) Cool air was coming at the exhaust outlet 2) Engine was started and was running successfully

The experimental results concluded that the 4-stroke engine has been successfully upgraded to a 2-stroke engine and the engine runs entirely on compressed air.

Conclusion

1}This paper presents the theoretical concept of engine design working by pneumatic technology. Here, the theoretical concept was also experimentally proven by replacing the 4-stroke engine with a 2-stroke engine and allowing the engine to run on compressed air.

2}In addition, trial results were presented showing the benefits of using CAE.

3}Therefore, CAE allows unlimited use of air resources as fuel to run the engine. CAE's proposed conceptual design helps to solve the problem by using a fuel that is renewable and at the same time cheaper to run.

4}The document also presents an overview of proposed future development of the engine to make it more efficient for public use.

REFERENCES

1} Brown , T. L. , Atluri V. P. , and Schmiedeler (2014). A low-cost hybrid drive concept based on compressed air energy storage. Applied Energy , 134 , 477489.do i.org/10. 1016 / j. apenergy.2014. 07.111.

2] Edels tein , S. (2015 , February 13). Tata airpods launch in Hawaii this year: report. Green Car Report , 13. Taken from http://www.greenc arrepo rts.com/news/I0 96772_tataa irpodcompressed aircartolaunchinhawaiithisyea rreport.

3] Hanlon, M. (2004). A significant new design of the pneumatic rotary engine. Make a map of , 15.Taken from http://new atlas.com/go/3185

4] Heywood, J.B. (1988). International Combustion Eng ine Fundamentals. New York , NY:McGraw-Hill, Inc.

5] Lampton, C. (n.d.). How the air car works. Fuel-Efficient Vehicle. Retrieved from howstuffworks.org website: http: //auto.howstuffworks.com/fuee ffic iency /veh ic!es/air-car l .htm

6]Lee, S. J., Shim, J., and Kim, K. C. (2015). Development of a power modulated compressor based on a two-stage rotary compressor, part I: modeling and simulation of compressor performance. International Refrigeration Magazine No. 54, 2237. doi. org / 10.1016 / j.ij refrig.2015.02.007

[7] LeGault , M. (2012).Next generation pressure vessels. CompositesWorld, 1-5. Retrieved fromhttp://www.composites world.com /artic les / ngene ration-pressure-vess els

8]Manish, M., Rathod, P. P., and Arvind, S. (2012). Study and development of compressed air engine-single cylinder: A review study. International journal of Advanced Engineering technology, 3(I), 271-274.

Mishra,K.R.,and Sugandh, G. (2014). Study about engine operated by compressed air (C.A.E): A pneumatic power source. IOSR 11(9), 99-103.