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Compressed Air Bike with Modification of 4-Stroke Si Engine

K. Sumanth[1], P. Nagababu[2], B. Kishore[3]

UG Students[1, 2, 3]
Department of Mechanical Engineering RSREC, Kadanuthala, India
sumanth1602[at]gmail.com[1], ponnapudinagababu[at]gmail.com[2], bikkamkishore[at]gmail.com[3]

Abstract: ***All four stroke cycles of petrol and diesel engines are operating with petrol and diesel fuels. According to literature reviews, petrol and diesel fuels are fossil fuels and emitting more emissions to atmosphere. Thus it is needed to make the internal combustions engines in to pollution free engines. We made a small attempt to operate the four stroke petrol engine with compressed air in place of petrol fuel. But it is very difficult to operate the four stroke engine with compressed air and focused on modification of four stroke single cylinder petrol engine in to two strokes to operate the engine with compressed air by modification of cam profile. The operations of engine are modified by changing cam profile and with new modified is successfully operated with compressed air. The engine is arranged in a Honda kinetic bike frame and petrol tank is replaced by compressed air tank with capacity of 10 bar.. The road test is conducted on bike for different pressers of air varying from 5 to 10 bar. This analysis leave some bench marks for the implementation of compressed air engine and going to replace the fossil fuels for engines such as LPG, petrol, diesel, CNG etc. The two stroke engine bike is successfully operated with compressed air.***

Keywords: compressed air engine, 4 stroke engine, 2 stroke engine, 100 cc engine

1. Introduction

In recent days the number of fossil fuel vehicles in cities as well as rural areas is increasing rapidly. The scientists giving warning to the world that the fossil fuels in the earth crust are going to be exhausted in a few decades. The eco friendly vehicles like battery vehicles and solar contains harmful elements like lithium is going to emit from the battery in case of any accident happen. This makes high impact on human beings as well environment also. The compressed air vehicles are one of the best replacements for that type of zero pollution vehicles which doesn't require a battery to run the vehicle.

Parts Used:

- Honda 100cc engine.
- 160 liters compressed air storage tank.
- 25 liters compressed air storage tank.
- Non return valve, flow control valves
- Pressure gauge and pipes for air passage

CAM Modification

Generally the cams are in eye shape as shown in figure-1 and modifies it in to elliptical shape by adding material to cam exactly 180 degrees and mould in to required shape by means of welding, grinding and few lathe operations. The final cam is in shape of ellipse as shown in figure-2

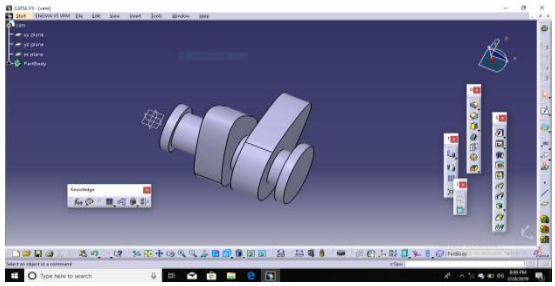

Figure 1: conventional cam of HONDA 100 cc engine

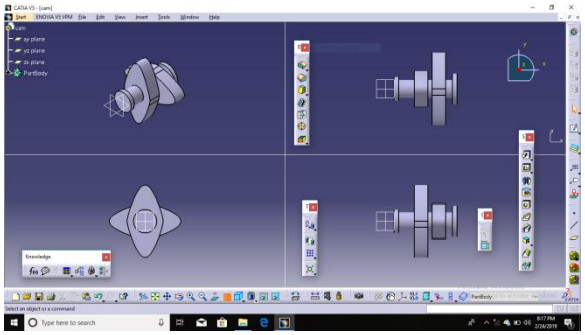

Figure 2: modified cam

Working of Compressed Air Engine:

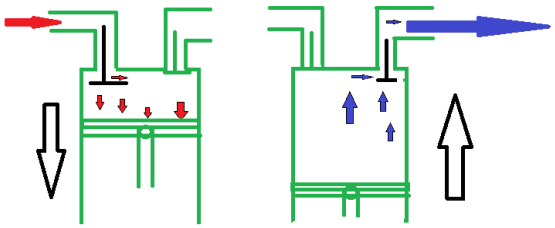

Figure 4: 2 stroke compressed air engine

Here from fig (a) the inlet valve opens when we give some force to the flywheel by means of kick rod. The compressed air Enters in to the cylinder through inlet valve And pushes down the cylinder with force and piston is moves downward during this process the pressure energy is converted in to kinetic energy and gives use full work in the form piston movement. When the piston reaches BDC the outlet valve opens due to cam movement and pressure difference occurs between atmosphere and engine hence the air goes out through exit valve. Up to here one cycle is completed and this repeated by using compressed air and cam movement.

- After assembling the engine is attached to a HOONDA kinetic bike frame.

Modifications to Bike Frame:

Figure 5: modified bike frame

The bike frame is modified in order to place a 25 liters tank to store compressed air in it. Two hallow rods with square crosses section is welded to avoid deformation of bike frame after modification and tank is welded to frame.

Figure 6: bike after storage tank is attached

Air Flowing Circuit:

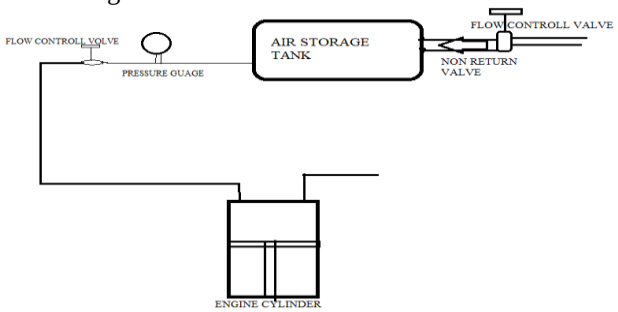

Figure 7: air flowing path

The air is filled in the tank just like as air filling in tyres. The air enters in to cylinder through non return valve and a flow control valve. The air is stored in the tank until we open the air in to cylinder. A pressure gauge is placed in the path of the air to calculate the pressure. Another flow control value is placed after pressure gauge to stops until we require it. Then the pipe is attached to engine inlet value with air proof joint. After expansion the air enters in to atmosphere through outlet valve.

Tests on Compressed Air Bike:

- Time taken to cover a total distance of 10 meters when air presser is at 10 bars (initially) with 160 liters tank.
- Rate of discharge through engine when air is at 8 bars (initially) with 25 liters tank.
- Distance covered by the bike with 25 liters tank. When air is at 8 bars (initially).
- Speed test on engine at different pressures with no load. When vehicle is in neutral condition with gears.

Results Obtained:

1. A total time of 5.56 sec is taken to travel a distance of 10 meters. This is the average value taken out of 8 trails each trail starts with 10 bar pressure.
2. The rate of discharge is too high when combined it with 25 liters tank. It lasts approximately 8 sec to decrease from 8 bars to 1 bar.
3. With the air in the 25 liters tank at 8 bar pressure the bike covers a total distance of 13.9 meters.

Table 1: engine speed test results

Sl. No.	Pressure (bar)	Speed (rpm)	Power (kw)
1	10	1344	2.28
2	9	1298	1.98
3	8	1260	1.71
4	7	1206	1.43
5	6	1142	1.16
6	5	1044	0.88
7	4	873	0.59
8	3	675	0.34
9	2	430	0.14

- Engine is starting at a pressure of 1.5 bars when kick rod used.

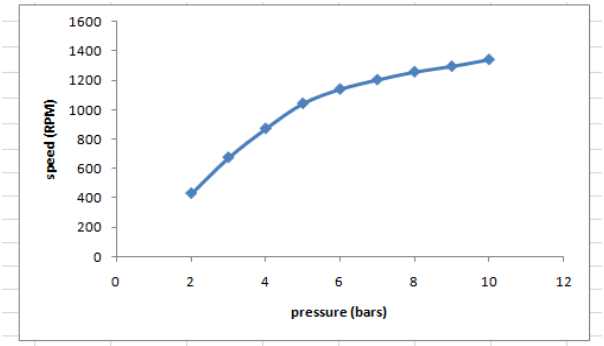

Figure 8: graph between pressure and speed of flywheel.

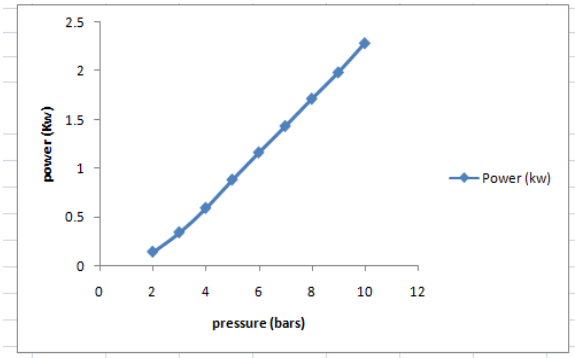

Figure 9: graph between pressure and power

2. Conclusion

The model designed by me is a small scale working model of the compressed air engine. When scaled to higher level it can be used for driving automobiles independently or combined (hybrid) with other engines like I.C. engines. This is a revolutionary engine design which is eco friendly, pollution free, but also very economical. This redresses both the problems of fuel crises and pollution. However excessive research is needed to completely prove the technology for both its commercial and technical

viability. It can be seen that the indicated power is increasing for increase of load. As load is increased, the speed falls down, to maintain it constant injection pressure has to be increased. As the injection pressure has to be increased, the indicated mean effective pressure gets increased; hence the indicated power is increased upon the application of the load. Though the applied load was small, however, the developed power was in proportion to the applied load. As load was applied the speed was reduced, to maintain it constant, the inlet air pressure has to be increased.

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