

Study of Compressed Air Engine and There Power Source

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Abstract

Compressed air as a source of energy in different uses in general and as a non-polluting fuel in compressed air vehicles has attracted scientists and engineers for centuries. Compressed air filled by electricity using a compressor. The electricity requirement for compressing air has to be considered while computing overall efficiency. The air engine is currently the most generally used device to convert potential energy of compressed air into mechanical energy. Nevertheless the compressed air vehicle will contribute to reducing air pollution and tend to zero pollution level and promoting great environment. No combustion process is occurring there. Light utility vehicles are becoming very popular means of independent transportation for short distances. Cost and pollution with petrol and diesel are leading vehicle manufacturers to develop vehicles fuelled by alternative energies. Engineers are directing their efforts to make use of air as an energy source to run the light utility vehicles.

Keywords: - compressed air, vehicles, and engine.

1. Introduction

Compared to batteries, compressed air is favourable because of a high energy density, low toxicity, fast filling at low cost and long service life. These issues make it technically challenging to design air engines for all kind of compressed air driven vehicles. To meet the growing demand of public transportation, sustainable with environmental consciousness, people are in the search for the ultimate to clean car with zero-emissions. It is hard to believe that compressed air can be used to drive vehicles. However that is true and "air car" as it popularly knows has caught the attention of research worldwide. MDI (Moteur Development International) is one company that holds the international patents for compressed air car.

Two technologies have been developed to meet different need (1) Single energy compressed air engines. (2) Dual energy compressed air plus fuel The single energy engines will be available in both Minicabs and City cats. These engines have been conceived for city use, where the maximum speed is 50 km/h and where MDI believes polluting will soon be prohibited with use of compressed air technology which having zero pollution level. The dual energy engine, on the other hand, has been conceived as much for the city as the open road and will be available in all MDI vehicles. The engines will work exclusively with compressed air while it is running under 50 km/h in urban areas. But

when the car is used outside urban areas at speeds over 50km/h, the engines will switch to fuel mode. The engine will be able to use gasoline, gas oil, biodiesel, gas, liquidized gas, ecological fuel, alcohol, etc. Both engines will be available with 2, 4 and 6 cylinders. When the air tanks are empty the driver will be able to switch to fuel mode, by car's on board computer.

2. WORKING

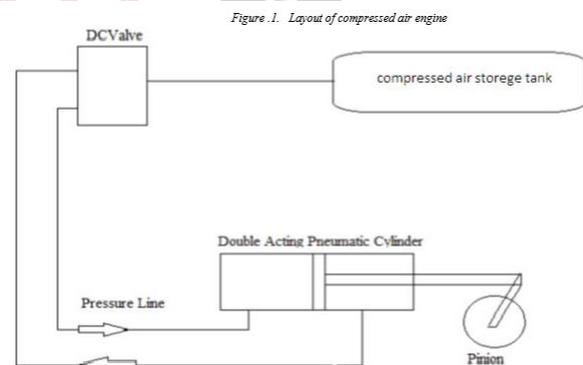


Figure 1. Layout of compressed air engine

A compressed air engine is a type of engine which does mechanical work by expanding compressed air. Pneumatic engine generally convert compressed air energy to mechanical work either into linear motion or rotary motion. Once compressed air is transferred into the onboard storage tank, it is slowly released to power the car's pistons. The motor then converts the air power into mechanical power. That power is then transferred to the wheels and becomes the source of

power for the car. The engine that is installed in a compressed air causes compressed air which is stored in the car's tank at a pressure as high as 4500 psi. The technology used by air car engines is totally different from the technology that is used in conventional fuel cars. Approximately 90m³ of compressed air is stored in fibre tanks in the vehicle. The engine is powered by compressed air, stored in a carbon-fiber tank at 30MPa (4500 psi). The tank is made of carbon fiber in order to reduce its weight. The engine has injection similar to normal engines, but uses special crank shafts and pistons, which remain at top dead centre for about 70 degrees of the crankshaft's cycle; this allows more power to be developed in the engine. The expansion of this air pushes the pistons and creates movement. The atmospheric temperature is used to re-heat the engine and increase the road coverage. The air conditioning system makes use of the expelled cold air. Due to the absence of combustion and the fact there is no pollution, the oil change is only necessary

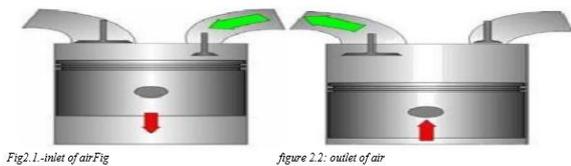


Fig2.1.-inlet of air Fig

figure 2.2: outlet of air

3. COMPRESSED AIR TECHNOLOGY

The basic object with Compressed air Technology is to implement in vehicle for consumption of minimum amount of energy and remain the output work same. In today's world, everyone wants to afford a vehicle and its energy to power it. Engine air technology makes it happen from many aspects. It is very less in term of mass as compared with other sources of energy for transportation of man or material. It also improves urban life style through sustainability & Non-polluting vehicle. Its impact on the environment is also considered low. It remains with intelligence, lighter, style and comfort.

3.1 ADIBATIC

A process which has no cooling and the heat does remains in the air which causing pressure rise that increases compression work requirements for the maximum value.

3.2 ISOTHERMAL

A process that provides perfect cooling, in which no changing in temperature of air and the work required for compression is tends to the minimum." But the given fig: indicates that isothermal expansion is higher than adiabatic expansion, the volume of the compressed air and flow rate are controlled at a particular compressed pressure.

CAT vehicles have significant economical and environmental advantages. With the incorporation of bio-energy (compressed air + fuel) the CAT Vehicles have increased their driving range to close to 2000 km with zero pollution in cities and considerably reduced pollution outside urban areas. Also, the application of the MDI engine in other areas, outside the automotive sector, opens a multitude of possibilities in nautical fields, co-generation, auxiliary engines, electric generators groups, etc. Compressed air is a new viable form of power that allows the accumulation and transport of energy

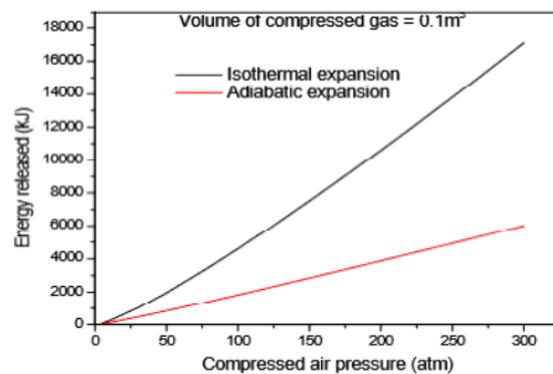


Figure 3 :Energy Released As A Function Of Compressed Pressure At Constant Volume

4. ADVANTAGES

- (1) Compressed -air vehicles are comparable in many way to electric vehicles, but use compressed air to the store the energy instead of batteries. Their potential advantages over other vehicles include.
- (2) Compressed -air technology reduces the cost of vehicle production by 20% because no need to build a cooling system, fuel tank, ignition system or silencers.
- (3) The engine can be massively reduced in size.
- (4) Low manufacture and maintenance costs as well as easy maintenance.
- (5) Compressed -air tanks can be disposed of or recycled with less pollution than batteries.
- (6) Lighter vehicles cause less damage to roads, resulting in lower maintenance cost.

5. CONCLUSION

It's important to remember that while vehicles running on only compressed air might seem like a distant dream, but they still have public interest due to their environmental friendly nature. After ten years of research and development, the compressed air vehicle will be introduced worldwide. If further improvement is carried out with stress analysis, thermodynamic analysis, minimize compressed energy loss and other losses then efficiency of CAE may be further increases.

6. REFRANCES

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