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A Review on Two Stroke Single Cylinder Compressed Air Engine

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Abstract –

In current days the fossil fuel burnt engines produce enormous amount of toxic emission which effect the living and nonliving beings. These emissions can be controlled but cannot be nullified totally. So in order to improve the scenario a new concept of engines can be developed which is propelled by Pressurized compressed air. Compressed air can be used to drive the current engine which can use and also the emission from such propelled fuel is nil. In current paper a review of total research is mentioned which marks a new level for researchers who can think in positive way of eco friendly engine propulsion.

Key Words: Compressed air, Zero Pollution, Engine, 2 stroke engine

1.INTRODUCTION

In the present energy scenario the fossil fuel sources are fast depleting and their combustion products are causing global environmental problems. According to Environmental climate researcher, future emission of 496 (282 to 701 in lower and upper bounding scenarios) gigatones of CO2 from combustion of fossil fuels by existing infrastructure between 2010 and 2060[1]. Forcing mean warming of 1.30 C (1.10 C to 1.40 C) above the pre industrial era and atmospheric concentration of CO2 less than 430 parts per million. However CO2 emitting infrastructure will expand unless extraordinary efforts are undertaken to development of alternatives.It is inevitable to shift towards the use of renewable energy resources which in turn will reduce pollution and saves fossil fuels. Air Powered Engine is an alternative technology which uses compressed air to run the engine and thus eliminates the use of fossil fuels. Exhaust temperature of it will be slightly more than atmospheric temperature (i.e. 20-25°C) and thus helps in controlling global warming and reducing temperature rise caused due to other means. As we are going to convert the already existing conventional engine into an air powered one, this new technology is easy to adapt. Another benefit is that it uses air as fuel which is available abundantly in atmosphere.

1.1 HISTORY OF TECHNOLOGY

Two centuries before that Dennis Papin apparently came up with the idea of using compressed air (Royal Society London, 1687). The Mekarski air engine was used for street transit (In 1872), consisting of a single stage engine. A numerous locomotives were manufactured and a number of regular lines were opened up (the first in Nantes in 1879)[1]. Robert Hardie introduced a new method of heating that at the same time served to increase the range of the engine which in turn helped to increase the distance that could be traveled at a stretch (In 1892).The engine as a compressor during deceleration, air and heat were added to the tanks, increasing the range between fill-ups. The first urban transport locomotive was not introduced until 1898, by Hoadley and Knight, and was based on the principle that the longer the air is kept in the engine the more heat it absorbs and the greater its range. Charles B. Hodges will always be remembered as the true father of the compressed air concept applied to cars, being the first person, not only to invent a car driven by a compressed air engine but also to have considerable commercial success with it. Guy Negre has developed an engine that could become one of the biggest technological advances of this century, after twelve years of research and development. He designed a low consumption and low pollution engine. First air cars will almost certainly use the Compressed Air Engine (CAE) developed by the French company, Motor Development International (MDI). Air cars using this engine will have tanks that will probably hold about 3,200 cubic feet (90.6 kiloliters) of compressed air. The vehicle's accelerator operates a valve on its tank that allows air to be released into a pipe and then into the engine, where the pressure of the air's expansion will push against the pistons and turn the crankshaft. This will produce enough power for speeds of about 35 miles (56 kilometers) per hour. When the air car surpasses that speed, a motor will kick in to operate the in-car air compressor so it can compress more air on the fly and provide extra power to the engine. The air is

also heated as it hits the engine, increasing its volume to allow the car to move faster.

2. Literature survey

Ulf Bossel et. Al.[2] analyzed thermodynamic processes and observed that at 20°C, 300 Liter tank filled with air at 300 bar carries 51 MJ of energy. This energy could be entirely converted to mechanical work at ideal reversible isothermal conditions. The overall efficiency was reduced to 40% or less due to effects of thermodynamic heat exchange, electrical efficiencies, mechanical and aerodynamic losses etc. They concluded that by increasing the number of compression and expansion stages, the total efficiency may be improved.

Arjit Mourya et. Al.[3]They manufactured the prototype of compressed air engine which had a vertical intake of air above the piston head. To alter the timing of the valves they changed the design of camshaft. After comparing Air Engine with the Electric Engine, it was concluded that the air engines were better than electrical ones.

Mistry Manish K., et. Al. [4] reviews compressed air engine on its design and development of mono cylinder engine. They concluded that a engine can propelled by compressed air where the compression can be fulfilled using electricity to the compressor. Moreover, the scarcity electricity requirement for running a compressor is of computing overall efficiency.

Abhishek Lal et.al. [5] Designed and analyzed dynamically a light weight single stroke compressed air engine. They evaluated that 2-stroke engine complete its one power stroke in every 180°. However the weight of the engine was reduced to greater extent. The engine provides a high power to weight ratio. Also power loss due to inertia of the moving parts was observed to be reduced. The start-up power was observed to nil. The engine since was runned using compressed gas and no fuel being combusted the exhaust air coming out of engine caused no harm to environment.

JP Yadav et. Al.[6] manufactured a proto type of horizontal, single cylinder low speed engine modified to run on compressed air. Due to no heat generation engine cooling was not necessary. Their experimental analysis were carried out on this modified engine to find out performance characteristics like brake power, mechanical efficiency, overall efficiency, air to Air ratio, volumetric efficiency, cost analysis etc. They concluded that the developed power was in proportion to the applied load. Also load applied was inversely proportional to the speed. So in order to compensate, the inlet air pressure was increased. Since the output speed was less, brake power recorded was significantly lower.

3. CONCLUSIONS

Conventional engine are in need of alternative fuel but even these engines running on Biofuels/ Biodiesel/Methyl esters posses higher UBHC, NOx emittents[7]. Also SI engines fuelled with non conventional sources like Ethanol which acts as a anti knocking agent, produces high amount of HC, CO and aldehydes emission. In such cases for the betterment of environment Compressed air Engine can be boosted. But their factor of load carrying capacity, material selection features and duration of run is still under study.

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