

GREEN ENGINE

(Turbo Combustion Green Engine)

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Abstract - Industrial Development and population growth have led to a surge in the global demand for energy in recent years. Abundant use of fossil fuels has caused depletion of fossil fuels and increase in pollution. Increase in pollution is mainly caused due to emission of exhaust gases from vehicles which run on fossil fuels . To overcome the energy crises various techniques has been implemented for use of renewable and green energy resources. The green engine is one of the most important discoveries of the century considering the depletion of fossil fuel and rise in level of population. It has got some magnificent features that were used for the first time in the making of engines. The Engine doesn't contain a typical piston with magnificent features like sequential variable compression ratio, direct air intake, direct fuel injection, Multi fuel usage etc. The Efficiency of this engine is high when compared to the traditionally used IC Engines and also the exhaust emissions are nearly zero.

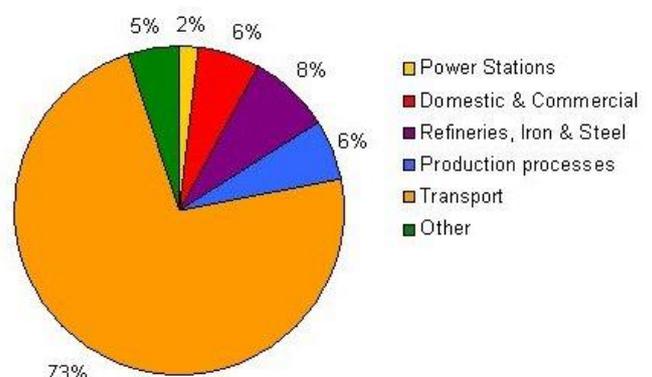
This Paper includes introduction to Green Engine , its technical features, working and comparison with the conventional IC Engines, also its Pros and Cons with future applications. A Green Engine is a Six Phased IC Engine. Due to six phases of working, air fuel mixing process and constant volume combustion with controlled time can be achieved. Hence green engine is the only multi fuelled engine which can work on any liquid or gaseous fuel. Thus the pollution and fuel depletion problems can be solved completely. Thus "GREEN ENGINE" will bring a complete transformation in the field of engine technology.

Key Words: Efficiency, Green Technology, Environment Friendly, Future Engine, Low Emission, Multi Fuelled.

1.INTRODUCTION

Industrial Development and abrupt increase in population has caused surge use of natural resources such as fossil fuels. Fossil fuels such as petroleum and may other are non renewable type of natural resources. Thus their use should be limited. Uncontrolled use of fossil fuels has brought downs the levels of fossil fuels to extension. Moreover their excessive use also has adverse effects on the environment the form of environmental pollution. Thus their use should be controlled. To minimize the fossil

fuel usage environment friendly fuels such as bio fuels should be used as an alternative. As most of the vehicles run on fossil fuels to bring down its usage we must make some modification to the conventional IC engines so that they are suitable of different types of fuels which cause lesser/ no environmental pollution Statistics show that, the daily consumption of petroleum all over the world today is 40 million barrels, of which about 50 per cent is used in communications and transportation. In this sort of consumption, about 70-80 per cent is for automobile use. That is to say, auto petroleum constitutes about 35 per cent of the whole petroleum consumption. In accordance with this calculation, daily consumption of petroleum by automobiles all over the world is over two million tones. At the same time as these fuels are burnt, poisonous materials such as 500 million tones of carbon monoxides (CO), 100 million tones of hydro carbons (HC), 550 million tones of carbon(C), 50 million tones of nitrogen oxides (NO_x) are emitted into the atmosphere every year, severely polluting the atmosphere. At the same time, large quantities of carbon dioxide (CO₂) gases, resulting from burning, have also taken the major responsibility for the "green house effect". However, it is estimated that petroleum reserve in the globe will last for only 38 years. The situation is really very grim. To counter this problem, the concept of green engine is introduced. This is six phase I.C. engine in which the priority is given to the complete mixing of fuel with the air thereby causing its complete burning. It is a multi fuel engine; therefore the fuel crisis can also be overcome.



Pie Diagram1: CO2 Emission by various sources

2. TECHNICAL FEATURES

Compared to conventional piston engine operated on four phases, the Green Engine is an actual six-phase internal combustion engine with much higher expansion ratio. The six phases are INTAKE, COMPRESSION, MIXING, COMBUSTION, POWER AND EXHAUST. The main features of this engine are High air charge rate, Satisfactory air-fuel mixing, Complete burning, High combustion efficiency, Full expansion, The most important characteristic is the expansion ratio being much bigger than the compression ratio. Also the other main features are The Sequential Variable Compression Ratio, Constant Volume Combustion, Self-adapting Sealing System. Because of these revolutionary inventions the engine has some advantages like The thermal efficiency of the engine is increased. The engine is free of the harmful emissions. As more power is obtained in a less space, the engine is more compact and light. Also the reciprocating parts are eliminated, so the engine is vibration free.

2.1 Direct Air Intake

Direct air intake means that there is no air inlet pipe, throttle and inlet valves on the air intake system. Air filter is directly connected to the intake port of the engine, therefore highest volumetric efficiency which makes engine produce a high torque of output on all speed range is achieved, and the pump loss which consumes the part of engine power is eliminated.

2.2 Strong Swirling

As a tangential air duct is between combustion chamber and compression chamber, a very strong swirling of air is achieved. Consequently, the air-fuel mixing and the combustion process can have a satisfying working condition.

2.3 Sequential Variable Compression Ratio

This greatly revolutionary innovation can provide the most suitable compression ratio for the engine whatever operation mode it works on with burning variety of fuels. Therefore, an excellent combustion performance is attained

2.4 Direct Fuel Injection

Direct fuel injection can provide higher output and torque, while at the same time it also enhances the response for accelerations

2.5 Super Air-fuel Mixing

Since the independent air-fuel mixing phase is having enough time for mixing air and fuel under strong swirling and hot situation, the engine is capable to burn any liquid

or gas fuels without modifications. An ideal air-fuel mixture could delete CO emission. Also centrifugal effect came from both strong swirling and rotation of the burner makes the air-fuel mixture denser near the spark plug, it benefits to cold engine starting and managing lean-burning, and allowing the engine use of mass control for output.

2.6 Lowest Surface to Volume Ratio

The shape of combustion chamber is paraboloidal. Thus a lowest surface-to-volume ratio is obtained, and the engine is having less heat losses and high combustion efficiency.

2.7 Controllable Combustion Time

Due to the independent combustion phase, compared to the conventional engine which performances lack of efficient combustion time resulting in heavy CO emission and low fuel usage rate, the Green Engine has a sufficient controllable combustion time to match any fuels.

2.8 Constant Volume Combustion

The fuels can generate more energy while the combustion is occurred on the constant volume. Also the constant volume combustion technology can allow the engine to have a stable combustion when the lean-burning is managed so the heat losses and NOx emissions are decreased.

2.9 Multi-power Pulses

The Green Engine operates on the multi-power pulses with a small volume of working chamber, resulting in compact structure and limited size. Also a small amount of air-fuel mixtures being ignited on each power pulse can greatly cut down explosion noise.

2.10 High Working Temperature

Because the burner, which is made by high heat resistance and low expansion rate material, such as ceramic, operates without cooling, and relatively high working temperature can eliminate the quenching zone which is main source of HC emission, and can greatly reduce the heat losses in the combustion chamber

2.11 High Expansion Ratio

High expansion ratio can make the burned gases to release much more power, in other words, the waste gases while they run out the engine are only bringing much less energy with them, therefore the engine's thermal efficiency is greatly raised, and at the same time, the noise and temperature of the exhaust are tremendously dropped.

2.12 Self-adapting Sealing System

This is another greatly revolutionary innovation applied in the Green Engine; it can eliminate a number of

seal plates or strips to achieve gapless seal and to provide most efficient and reliable seal system with less friction

2.12 Vibration Free

As major moving parts, vanes, which are counted in little mass and operated symmetrically, the performance of the engine is very smooth got away from vibration.

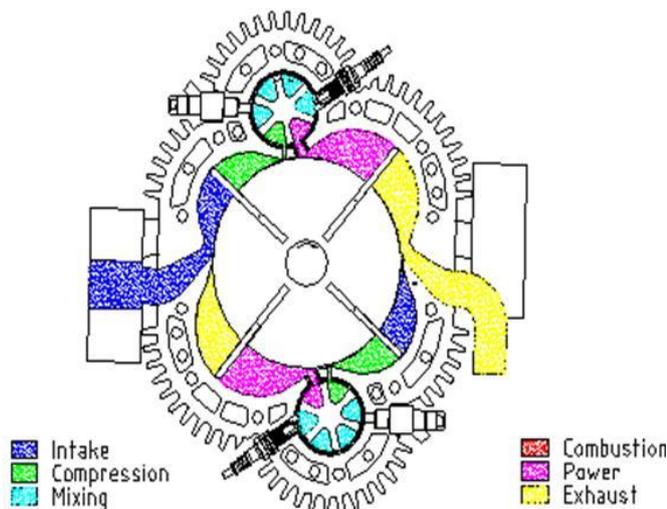


Figure 1: Schematic Diagram of Green Engine

3. WORKING OF THE GREEN ENGINE

The Green Engine has six phases which occur in the following sequence.

- Intake
- Compression
- Mixing
- Combustion
- Power
- Exhaust

3.1 Intake

The air is admitted directly inside the compression chamber. The air does not undergo any treatment before entry. The air filter is directly connected to the entry of the intake pipe. The amount of the air intake can be varied as per the fuel used.

3.2 Compression

The air admitted in, then enters into the compression chamber. The compression chamber has variable area. The central disc having arms pushes the air in the compression

chamber. The compression chamber is connected to the combustion chamber by a small diameter duct which is tangent to the combustion chamber. So as arm pushes the air in the compression chamber the pressurized air is forced to flow through this duct. As the air flow through it, the air is swirled very fast. The air thus enters the combustion chamber.

3.3 Direct Fuel Injection

One more facility is provided in the green engine is that of direct fuel injection. The fuel injected is also variable. The amount of fuel injected is varied as per the mode of the vehicle.

3.4 Super Mixing

The combustion chamber is also rotating. This centrifugal force from the rotation along with the strong swirling causes the fuel to mix with air. The mixing assures the complete burning of the fuel. The super mixed charge is forced by the arm towards the spark plug.

3.5 Combustion

The charge is ignited by the spark plug. The combustion time can be varied to burn different grade of fuels. The controlled combustion time gives the complete burning of the charge. The emissions are greatly reduced.

3.6 Power

The burned products of the combustion are expelled out of the combustion chamber. The high pressure gases push the arm of the compression chamber causing work output. The power is obtained in the form of the power pulses. These pulses reduce the area of the engine. The power pulses also reduce the explosion noise.

3.7 Exhaust

The burned gases are expelled out. The gases are first expanded in the expansion zone. The expansion ratio is more which ensures the maximum work output. Also the maximum energy is gained from the gases. The temperature also reduces and hence an optimum utilization of the burned gases is achieved. The burned gases after expansion are pushed into the exhaust pipe and released into the atmosphere. Thus the six-phase cycle is completed.

Comparison of Green Engine with Conventional IC Engines			
Item	Green Engine	Standard Piston Engine	Diesel Engine
	THT- C1B	Volvo Penta 230 S	Hercules 3400 DT

Power	120 hp	120 hp	120 hp
Weight	60 lbs	400 lbs	935 lbs
Volume	1 Cubic ft.	11.1 Cubic ft.	20 Cubic ft.
Size	15" Diameter X 10" L	25" W X 24"H X 32"L	----

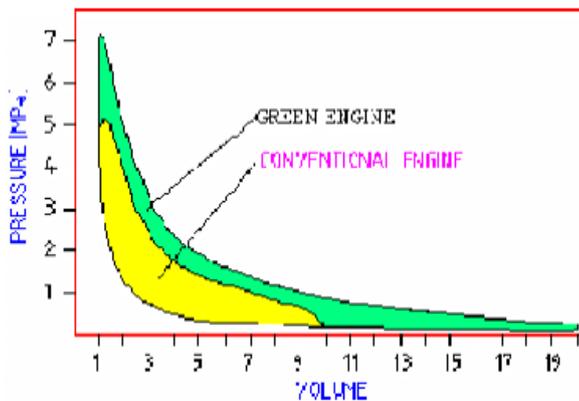


Fig 4. Graph of work and power output

4. ADVANTAGES

As obvious from the technical features which include effective innovations, the advantages of the Green engine over the contemporary piston engines are many.

4.1 Small Size and Light Weight:

As Green engine is very compact with multi-power pulses, the size and weight could be 1/5 to 1/10 of the conventional piston engines on same output. Its power to weight ratio could be more than 2 hp per pound without supercharge or turbo charge.

4.2 Limited Parts:

There are only some dozens of parts easy to be manufactured in the engine structure.

4.3 High Efficiency :

Because many great innovations are being employed in the engine design such as: direct air intake, sequential variable compression ratio, super mixing process, constant volume combustion, controllable combustion time, high working temperature of the burner, high expansion ratio and self adapting sealing system etc., the thermal efficiency of the engine could be potentially as high as 65 %, even more if water add-in technology is to be considered.

4.4 Multi-fuels:

Due to six phases of working principle, super air fuel mixing process and constant volume combustion with controllable time, the Green engine becomes the only real multi-fuel engine on our planet; any liquid or gas fuels can

be burnt well. Also it would be ideal to coal powder if special anti-wearing material is employed.

4.5 Smooth Operation :

Due to inherence of good dynamic and static balance the performance of the Green engine is as smooth as an electric motor.

4.6 Quietness and Low Exhaust Temperature:

Burst out under small amount of mixtures, free of vibrations, and high expansion ratio make the Green engine much quieter. It is really environment-friendly. Green engine vehicles could transport troops on the battlefield of the future, and could serve as a vital source of auxiliary power in combat. This is because these engines are quiet, flexible and operate at low temperature, making them ideal for use in "stealth" vehicle.

4.7 Low Cost :

Limited parts, small in size, light in weight and depending upon current mature materials and manufacturing technologies, mean that it would be done at much lower cost on manufacture, transportation, installing to other devices, and maintenance

5. APPLICATIONS

The Green Engines could be used as the ideal power plants on a very wide range of applications in transportation, communication, farm, mine, engineering, military uses, such as automobiles, aircrafts, boats, ships, hovers, tractors, locomotives, generators, snowmobiles, chainsaws, helicopters, tanks, torpedoes, submarines etc

6. CONCLUSION

The environmental problems can be effectively overcome by the use of Green engine. It can use almost any type of fuel available. It is superior to the conventional I.C. engine in terms of smooth operation, efficiency and cost. Compared to conventional piston engine operated on four phases, the Green Engine is an actual six-phase internal combustion engine with much higher expansion ratio. Already it is being used in some of the application like aircrafts, ships and locomotives. Research is going on for its effective use in wider range of transport vehicles

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