

4 Stroke Engine with 2 Power Strokes

Md.Fakhruddin H.N.¹, Mohammed Yousuf Ali² and A.P.V. Prasad Rao³

¹Methodist College of Engineering & Tech.

²Nawab Shah Alam Khan College of Engg. & Tech.

³Methodist College of Engineering & Tech.

E-mail: ¹mfhnn@yahoo.com, ²yousufonline@yahoo.com, ³prasadraoapv@gmail.com

Abstract—In today's automobile world it is a great desirable challenge to build an engine having more power generation & less fuel consumption, which are desired parameters for the increased efficiency of the engine. For getting more power engine needs more fuel and if less fuel consumption is needed the power transmitted will be less. In conventional engines the heat energy using is 30% of produced energy and the remaining energy nearly 70% is going as waste. That means, to get more power from engine the fuel resources are wasting by wasting the 70% of produced energy, if less fuel consumption rate is desirable the more power generation should be sacrificed.

Present innovation namely 4 stroke engine with 2power strokes is introduced in order to overcome these problem, the piston will execute 2nd power stroke without using gasoline fuel. By the introduction of this engine it is more beneficial to the automobile industry because of its more power generation & reduced fuel consumption rates.

1. INTRODUCTION

In the 2 stroke engine the piston makes 2 strokes in cylinder per cycle & the crank shaft makes one complete revolution. Advantage of 2 stoke engine is that the piston executes one power stroke per every 2 strokes of piston & one revolution of crankshaft and Disadvantage is, it consumes more fuel to develop one power stroke in a cycle where as in 4 stroke engine piston makes 4 strokes in cylinder per cycle and crank shaft makes 2 complete revolutions. Advantage of 4 stroke engine is that it consumes less fuel to develop one power stroke in a cycle and the disadvantage of 4 stroke engine is that the power generated by the engine is comparatively low. In the six stroke engine also fuel consumption is less but power generation is less compared to 2 stroke engine.

The present innovation "4 stroke engines with 2 power strokes" overcomes the disadvantages of both 2 stroke and 4 stroke engines. In this engine after 2stokes of the 2stroke engine, hot water is injected into cylinder and by utilizing the high temperatures present in the engine cylinder water changes its phase to steam and it will expand in the cylinder results in another power stroke. According to the experimental results 1ml of water will be converted to 1800 ml of steam when it changes its phase. So that the quantity of water required is also less.

This engine captures the heat energy wasting in case of conventional engine. In this engine a water tube will be placed in such a way that it will be in contact with engine cylinder walls and the other side of water tube will be in contact with an another pipe through which hot exhaust gasses are passing. The water in the water pipe or jacket will capture the heat emitting from engine without releasing it to the environment as waste and on other hand the water also captures the heat from the hot gasses escaping from engine cylinder as exhaust.

2. ADVANTAGES OF THIS ENGINE

1. This engine thermal losses are decreased and thermal efficiency may increased by 40-55%
2. And as the water is using as working fluid for second power stroke, the quantity of fuel require is reduced by 50-60%, resulting the 50-55% increase in the mechanical efficiency
3. Also the need of cooling system is eliminated which further results in reduction in weight of engine by 10%.
4. The environment pollution (by the emission of hot gasses into atmosphere) may be reduced by 45-55%.
5. Two power strokes

Two parallel functions take place, inside and outside the engine cylinder

3. EVENTS OUTSIDE ENGINE CYLINDER

1. Intake of water
2. Heating of water by means of heat exerted by the engine cylinder walls.
3. Heating of water again exhaust emission of fuels
4. Transferring the heated water into engine cylinder

4. EVENTS INSIDE THE ENGINE CYLINDER

Inside the engine cylinder again two functions takes place on both sides of the engine

1. Intake of hot water & power stroke by fuel
 2. Compression and transfer of hot water & Exhaust of combustion products
 3. Power stroke by steam & intake of fresh charge (Fuel+air)
 4. Compression and transfer of charge & Exhaust of steam
- 5. PRINCIPLE OF 4STR. ENGINE WITH 2 POWER STR.**

The 4 stroke engine with 2power strokes captures the heat waste from the 2 stroke engine and utilizes it to produce an additional power stroke of piston. Either steam or Air can be used as working fluid for second power stroke .It is not only giving an additional power stroke but also eliminates the need of a cooling system and makes engine lighter by 5-10 % & also increases the efficiency of the engine by 45-50 % . In this engine piston moves up and down 4 times out of which 2 are power strokes, one by fuel and other by steam. After the exhaust stroke in 2 stroke engine, instead of air fuel mixture hot water (which is converted to steam)will enter from water inlet & is exhausted in 4th stroke. So that, overlapping of ports is reduced & better scavenging is obtained. Because of this action fuel consumption is reduced by 50% - 60 % & huge reduction in the pollution. The variety of fuels can be used to run the engine.

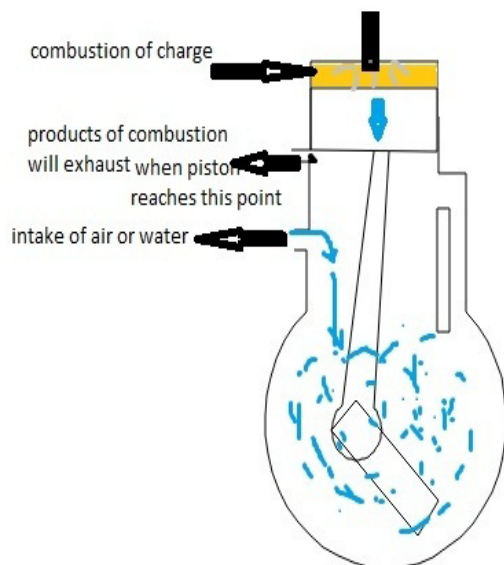


Fig. 1: Working of 4stroke with 2 power stroke

6. MODIFICATIONS IN 4 STROKE ENGINE WITH 2 POWER STROKES

Some modifications are to be done to the specific parts of the 2 stroke engine so as to run the engine successfully. The modifications are:-

1. A water jacket is to be placed around the engine cylinder walls to capture the heat from combustion chamber.

2. A pipe arrangement should be done around the water jacket to heat the water.

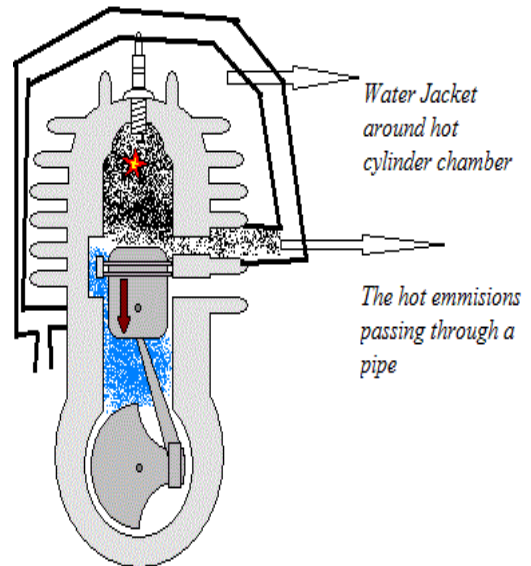


Fig. 2: Water jacket & pipe arrangement around the engine

3. Two solenoid valves are to be placed, one is to pump the (fuel+air) mixture and other is to pump the hot water to the inlet port.
4. The outlets of the two solenoid valves are made to be single pipe & it is to be connected to the inlet port of the engine.

7. WORKING OF THE 4 STROKE ENGINE WITH 2 POWER STROKES

The different strokes of the engine are

First stroke

In this engine two functions will happen on both sides of the piston. On the top side of the piston, combustion of fuel+air will occur resulting in a power stroke by the action of spark plug and on bottom side of the piston hot water will be sucked while the piston moves from TDC to BDC.

Second stroke

In the second stroke the products of combustion will be exhausted on top side of the piston & on the bottom side of the piston the hot water will be transferred to the combustion chamber through transfer port. In this stroke piston moves from BDC to TDC.

Third stroke

In the third stroke, the hot water entered into the combustion chamber will be converted to steam and will expand resulting an another power stroke on top side of the piston. On bottom side of the engine fuel+air mixture will be sucked & compressed. The piston moves from TDC to BDC.

Fourth stroke

In the fourth stroke fuel+air mixture will be sucked into the cylinder on bottom side of piston. And steam products will be exhausted on the top side of the piston. Piston moves from BDC to TDC.

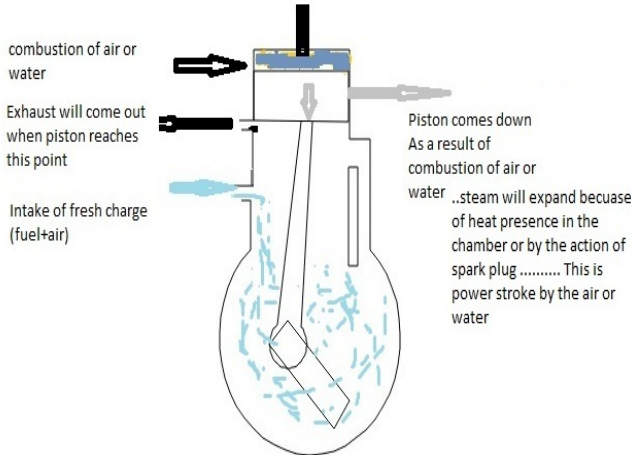


Fig. 3: Working strokes diagram for First stroke

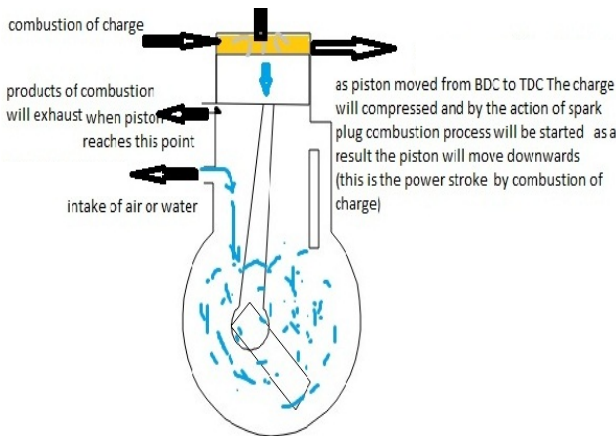


Fig. 4: Working strokes diagram for second stroke

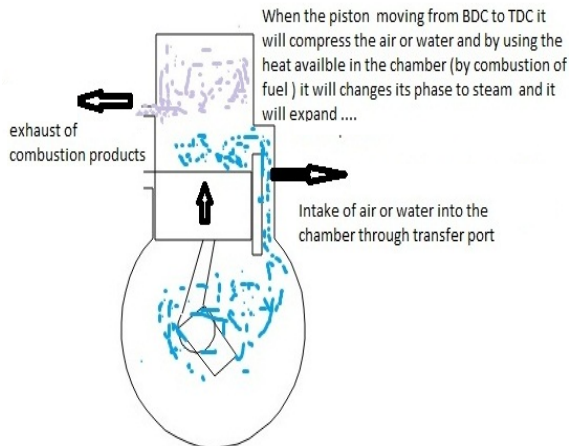


Fig. 5. Working strokes diagram for third stroke

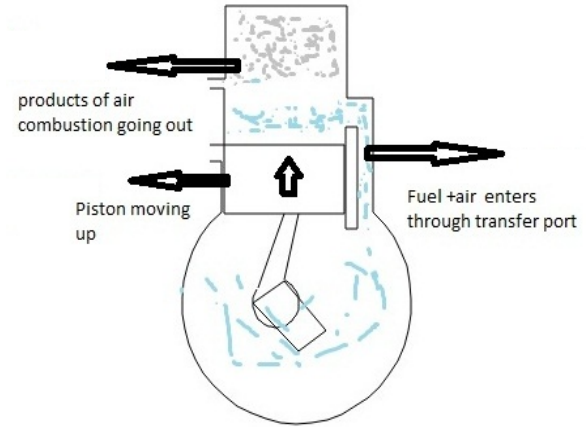


Fig. 6: Working strokes diagram for fourth stroke

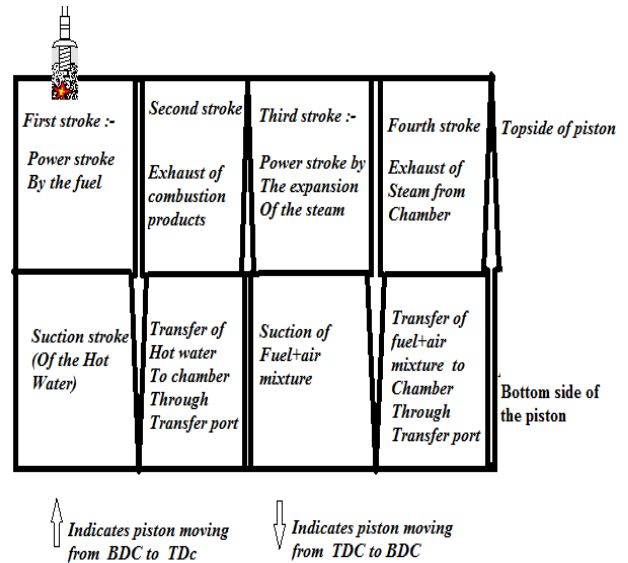


Fig. 7: Sequence of operations diagram

8. ADVANTAGES OF 4 STROKE ENGINE WITH 2 POWER STROKES OVER 2-STROKE,4-STROKE& 6-STROKE ENGINES

- 1. Reduction in fuel consumption rate:**
As the water is using as working fluid, fuel consumption rate is reduced by 50-60%. It is more compared to 2-stroke, 4-stroke engines & approx. equal to six stroke engine.
- 2. Increased torque or power generation:**
In this engine because of 2 power strokes, the power generation is more compared to 2-stroke engine & as usually as the power generated/cycle in 2-stroke engine is more than 4-stroke and 6-stroke, the power generated/cycle is more in this engine.
- 3. Reduction in pollution :**

Noise is reduced in this engine and the thermal pollution is reduced by 40-50 % ,on other hand black smoke, HC, CO,NOX are reduced in the exhaust.

4. Multi fuel

A large variety of fuels can be used in this engine, like vegetable oil, fossil oils & animal grease. Methanol–Petrol mixture and Hydrogen–Petrol mixture are also recommended for this engine.

5. As the fuel consumption is reducing and power generation is more the mechanical efficiency is increased by 50-55%.

6. And as the water jacket is used around the chamber of the cylinder thermal efficiency is increased by 40-55%.also engine is light in weight as the cooling system is removed.

9. CONCLUSION

By the application of this technology the automobile industry has massive change in the both environment and world economy with increased power generation rates.

Wonderingly there is no perfect replacement for the internal combustion engines, to get any specific increase in parameters only the modifications are to be done resulting in improved economy & Eco friendly.

Introduction of this engine into automobile industry would have a enormous change in the efficiencies and the fuel consumption rate, assuming that the mechanical efficiency is increased by 45-55%, thermal efficiency is increased by 50-55 % , the fuel consumption rate is decreased by 50-60% and pollution emissions by 70-90% with increased power generation rates.

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