

A REVIEW ON SIX STROKE ENGINE

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ABSTRACT

On this day the most difficult challenges in engine technology to increase engine thermal efficiency. Therefore two more additional strokes are the fifth stroke, which called water injection stroke (second power stroke) while the last stroke is called exhaust stroke is include in engine. On this paper the six stroke engine is described. The rapid vaporization of the water during the fifth stroke is similar to the combustion of the gasoline. The combustion converts chemical energy into usable power, and likewise, the vaporization of water converts waste heat energy into usable power. The automotive industry may soon be revolutionized by a new six- stroke design which adds a second power stroke, resulting in much more efficiency with less amount of pollution.

Keywords; Engine, stroke, combustion, heat, efficiency.

1 INTRODUCTION

One of the most difficult challenges in engine technology today is the urgent need to increase engine thermal efficiency. The six-stroke engine is a type of internal combustion engine with an advance feature of more power generation some complexity intended to make it more efficient and utilize the fuel. Two more additional strokes are the fifth stroke, which called water injection stroke while the last stroke is called exhaust stroke. Besides, the stroke engine also known as engine two-stroke, four-stroke and also six-stroke which are new things for us. The specific power of the six-stroke engine will not be less than that of a four-stroke

petrol engine, the increase in thermal efficiency compensating for the issue due to the two additional strokes. Chemical, noise and thermal pollution are reduced. These engines almost consist of similar components as that of the four stroke engine with addition of two more valves. The six-stroke engine is a radical hybridization of two and four stroke engine that the top portion of two stroke engines and the bottom rather the middle section of a four stroke engine. In six-stroke cycle, two parallel functions occur in two chambers which result in eight event cycle: four events internal combustion cycle and four event external Combustion cycles.[1] The Six Stroke is thermodynamically more efficient because the change in volume of the power stroke is greater than the intake stroke and the compression stroke.

ABOUT SIX STROKE ENGINE

To further the study of six stroke engine in short-term, unconventional solutions, a one cylinder, four- cycle, 16-horsepower, internal combustion engine has been modified with the goal of higher efficiency. A four stroke engine has been modified to a six stroke engine by adding a steam cycle, such that the engine

- (1) Intakes
- (2) Compresses
- (3) Combusts,
- (4) Exhausts,
- (5) Injects water
- (6) Re-exhausts [2]

The rapid vaporization of the water during the fifth stroke is similar to the combustion of the gasoline. The combustion converts chemical energy into usable power, and likewise, the vaporization of water converts waste heat energy into usable power. By harnessing waste heat, the added strokes effectively reduce fuel consumption, and therefore emissions, without significantly compromising on power. The big advantage is that, we have got in six stroke engine, the waste of heat created the power in fifth stroke, and power has to be generated in the fifth stroke Due to the waste of heat. The heat is used to generate the steam from the water which is further used as a working fluid for the Additional Power Stroke. As well As extracting power, the additional stroke cools the engine and removes the need for a cooling system making the engine lighter and giving 40% increased efficiency.

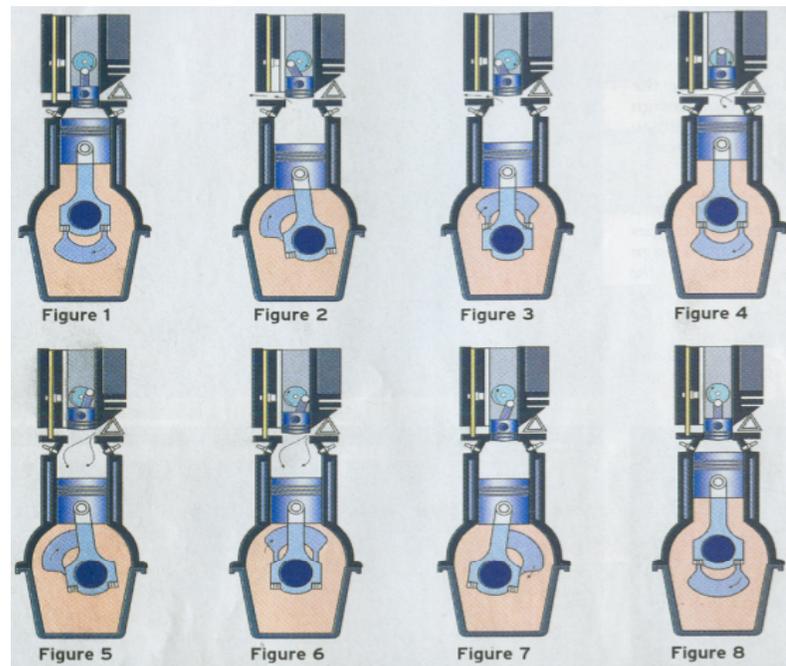


Figure1- Six stroke engine & their working function[4]

WORKING OF SIX STROKE ENGINE

Six Strokes engine has consist of the six processes in a complete cycle such as four stroke engine consist only four process in a complete cycle. These six processes are as

3.1 FIRST STROKE (SUCTION STROKE)

During the first stroke the Inlet valves opens and air- fuel mixture from carburettor is sucked into the cylinder through the inlet valve and piston moves from TDC to BDC.

3.2 SECOND STROKE (COMPRESSION STROKE)

During the second stroke, piston moves from BDC to TDC. Both the inlet valve and exhaust valves are closed and the air- fuel mixture is compressed.

3.3 THIRD STROKE (FIRST POWER STROKE)

During the third stroke, power is obtained from the engine by igniting the compressed air- fuel mixture using a spark plug. Both valves remain closed. Piston moves from TDC to BDC.

3.4 FOURTH STROKE (EXHAUST STROKE)

During the fourth stroke, the exhaust valve opens to remove the burned gases from the engine cylinder. Piston moves from BDC to TDC.

3.5 FIFTH STROKE (SECOND POWER STROKE)

During the fifth stroke, the exhaust valves remains close and the water Inlet valves open. Fresh water from the water Inlet valves enters the cylinders through the secondary water Induction system. Piston moves from TDC to BDC.

3.6 SIXTH STROKE (SECOND EXHAUST STROKE)

During the sixth stroke, the water exhaust valves remain open. The water sucked into the cylinder during the fifth stroke is removed to the atmosphere through the water exhaust valve. Piston moves from BDC to TDC and six stroke is completed.[3]These are the process that may be repeated again & again and the engine start working with the high amount of power and torque production with less fuel consumption. The six stroke engine may be further work in the otto and duel cycle. In a six stroke engine the energy absorption is less because of slower acceleration of reciprocating parts The piston speed of the upper piston is about a quarter of the main piston; therefore its service life should be at least twice that of the main piston.

Table1- valve timing stroke [5]

Degree of Shaft Rotation	Compressor Stroke	Combustion Chambers 1&3	Combustion Chambers 2&4	QT Chambers 1&3/Stroke	QT Chambers 2&4/Stroke
1	Compression	Discharge	Charge	Power	Exhaust
46	Intake	Discharge	Ignition	Power	Exhaust
91	Compression	Charge	Discharge	Exhaust	Power
136	Intake	Ignition	Discharge	Exhaust	Power
181	Compression	Discharge	Charge	Power	Exhaust
226	Intake	Discharge	Ignition	Power	Exhaust
271	Compression	Charge	Discharge	Exhaust	Power
316	Intake	Ignition	Discharge	Exhaust	Power

4 ADVANTAGE OF SIX STROKE ENGINE

The following Advantage of six stroke engine are as follows-

1. Thermal efficiency reaching 50% (30% for the actual internal combustion Engine).
2. Fuel consumption reduced by more than 40%.
3. Reduction of chemical, noise and thermal pollution.
4. Two expansion (work) through six stroke.

5. Direct Injection and optimal fuel combustion at every engine speed.
6. We can eliminate the radiator.
7. We would get the better scavenging in fifth stroke.

5 DISADVANTAGE OF SIX STROKE ENGINE

The following disadvantages of six stroke engine are as follows

1. High Initial cost Due to change in gear structure.
2. High Manufacturing cost in six stroke engine.
3. Engine size Increases Due to additional stroke in engine, fifth stroke and sixth stroke.[3]

6 MODIFICATIONS IN SIX STROKE ENGINE

The following mechanism would want to be modification in six stroke engine.

6.1 CAMSHAFT MODIFICATIONS

In the six stroke engine the 360 degree of the cam has been divided into 60 degree among the six stroke. The exhaust cam has 2 lobes to open the exhaust valve at fourth stroke (first exhaust stroke) and at the sixth stroke to push out the steam.

6.2 CRANKSHAFT TO CAMSHAFT RATIO MODIFICATION

In conventional four stroke engine, the gear at crankshaft must rotates 720. while the camshaft rotates 360 to complete on cycle for six stroke engine, the gear at the crankshaft must rotates 1080 to rotates the camshaft 360 and complete one cycle. Hence their corresponding gear ratio 3:1

6.3 CAM FOLLOWER MODIFICATION

The bottom of shape of regular follower has the flat pattern, which is suitable with the normal camshaft for four stroke engine. When reducing the Duration of valve opening from 9000 to only 6000 the shape of the follower must be changed from flat to roller or spherical shape.

CONCLUSION

The six stroke engine modification promises dramatic reduction of pollution and fuel consumption of an internal combustion engine. Its adoption by the automobile industry would have a tremendous impact on the environment and world economy, assuming up to 40% reduction in the fuel consumption and 60% to 90% in polluting emissions, depending on the type of fuel being used and the second piston replaces the valve mechanism of a conventional engine and also it increases the compression ratio.

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