A STUDY OF SIX STROKE ENGINE

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ABSTRACT

The name itself shows that this engine is a cycle of six strokes where two strokes are the power strokes. This is additionally a reciprocating sort of engine with twofold progression of charge and it very well may be both internal and external ignition. It totally differ with the 2 stroke and 4 stroke engine because of its thermodynamic cycle. This type of engine consist of a “modified cylinder head” with “with two supplementary chambers” one is combustion chamber and the other one is an air heating chamber and both the chambers are totally independent from the cylinder. The design analysis of this type of engine is quite easy because of separated cylinder and combustion chamber.

In this type of engine two valves are added with comparison of four stroke engine and both the valves are operated by an arrangement of piston. This engine is more efficient thermodynamically because the volume change in power stroke is more than the compression stroke and intake stroke. The leading advantage of this engine is “the reduction in fuel consumption by 40%”, there are two power stroke in the cycle of six strokes, and it is also less polluting type of engine. Six stroke engine's selection by the vehicle industry would tremendously affect the earth and world economy.

Key words: Stroke, Engine, Efficiency, Fuel, Heat.


1. INTRODUCTION

In inside ignition engine, working on various cycles have one regular element, burning happening in the chamber after each compression, bringing about gas development that demonstrations straightforwardly on the cylinder (work) and constrained to 180° of crankshaft point.

As indicated by its mechanical structure, the six stroke engine[1] with internal and external ignition what's more, twofold stream is like the real inner responding ignition engine. In any case, it separates itself altogether, because of its thermodynamic cycle and an adjusted chamber head with two advantageous chambers: Combustion, doesn't happen inside the
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chamber however in the advantageous burning chamber, doesn't act quickly on the cylinder, and it's term is free from the 180° of crank shaft revolution that happens during the development of the burning gases (work).

The burning chamber is completely encased inside the air-warming chamber. By heat trade through the shining ignition chamber dividers, air pressure in the warming chamber increases and create control for a valuable work stroke. A few favourable circumstances result from this, one very significant being the expansion in warm effectiveness. In the contemporary inside ignition engine, the vital cooling of the ignition chamber dividers produce significant calorific losses. In the primary chamber, burning happens each turn as in a two-stroke engine and oil as in a four-stroke engine.

Fuel injection can occur in the cylinder charger[2], in the gas move divert or in the ignition chamber. It is likewise conceivable to charge two working chambers with one cylinder charger. The blend of reduced plan for the burning chamber together with no loss of fuel and air is professed to give the engine more power, more torque and better fuel utilization.

In six strokes the motor catches the depleted warmth from the four stroke cycle and uses it to get an extra power and fumes stroke of the cylinder in a similar chamber. This warmth is utilized to produce the steam from the water which is additionally utilized as a working liquid for the extra power stroke. This steam will powers the cylinder down. Just as extricating power,

The extra stroke cools the motor by water and evacuates the requirement for a cooling framework making the engine lighter.

2. LITERATURE REVIEW

2.1 Six Stroke Engine

This segment clarifies the valuable angles in a six stroke motor which doesn't exist in a 4 stroke engine. The significant contrasts between 4 are 6 stroke engine are the additional 2 strokes of which the fifth stroke is the power stroke. It is of 2 kinds recorded underneath:

2.1.1 Air Induction System

The six strokes engine as talked about before are fundamentally utilized for high efficiency and high power output[3]. Noticeable all around acceptance system, the air from air channel is then passed to the mass stream sensor. The mass wind stream sensor in the system shows the wind stream though there is likewise an admission temperature sensor which helps in deciding the temperature. As there is high power and efficiency, it will be in any case in saying that there will be high compression proportion in the system. This prompts explosion impact or pre-start in the system. This impact produces noises which is these days dispensed with by utilizing a silencer. The air acceptance system therefore comprises of high temperature admission air, as there are the turbochargers and superchargers in the engine which give heat to the inlet air. This heat can additionally be disposed of by the intercoolers which help in cooling the temperature of the hot packed air and hence decline its weight. This expands the exhibition by dismissing heat into the climate. As it gives higher power and is valuable in high burden limit motor, this system can be found in flying machines.

2.1.2 Water Injection

Water as it is known for its solid properties has a particular heat estimation of about 4.18 J/g °C The vaporization of water or any fluid is considered by its property called as 'the idle heat of vaporization'[4] which decides the adjustment in condition of water from fluid to vaporous
state. As found in the 6 stroke engine, there is an additional power stroke separated from the one existing force stroke in the four stroke motor. After the admission, compression, start and exhaust strokes there is water infusion in the system. It is done so as to anticipate explosion in the system. As the air is then input into the fifth stroke it prompts an exceptionally high weight in the system which offers ascend to higher pressures.

These weights and temperatures lead to an unstable consuming of air which demonstrates to be destructive for the motor. The water infusion system is introduced after the temperature surpasses 40°C. It gives higher pressure proportions and along these lines gives antiknock properties to the framework which help in shielding the framework from explosion just as give an effective power stroke. Boeing B-52 at first utilized water infusion for departures as these system are required for higher burden conveying limit vehicles. The water infusion strategy is dared to be superior to air enlistment technique since water has a higher heat injection limit than air likewise when air assimilates the warmth and extends in the fifth stroke it produces high weights in the engine head prompting high weight on chamber.

2.2 Hybrid Technology

The gas electric crossover vehicle is exactly what it seems like - a hybrid between a gases controlled vehicle and an electric vehicle[5]. A gas-controlled vehicle has a fuel tank, which supplies gas to the engine. The engine at that point turns transmission, which turns the wheels.

The hybrid is a trade-off. It endeavours to fundamentally expand the mileage and diminish the discharges of a gas-fueled vehicle while beating the weaknesses of an electric vehicle.

To be helpful to you or me, a vehicle must meet certain base prerequisites. The vehicle ought to have the option to:

- Drive at any rate 300 miles (482 km) before re-energizing.
- Be refueled rapidly and effectively.
- Keep up with the other traffic out and about.

A gas vehicle meets these prerequisites yet delivers a moderately huge measure of contamination and for the most part gets poor gas mileage. An electric vehicle, in any case, creates no contamination, yet it can just go 50 to 100 miles (80 to 161 km) between charges. What's more, the issue has been that the electric vehicle is moderate and awkward to energize.

A fuel electric vehicle consolidates these two arrangements into one system that use the two gas power and electric power. Fuel electric hybrid vehicles contain the accompanying parts:

- Gasoline engine- the crossover vehicle has a gas engine a lot of like the one you will discover on most autos. In any case, the engine on a hybrid is littler and utilizes cutting edge innovations to diminish outflows and increment proficiency.

- Fuel tank–The fuel tank in a hybrid is the vitality stockpiling gadget for the gas engine. Gas has an a lot higher energy thickness than batteries do. For instance, it takes around 1,000 pounds of batteries to store as a lot of vitality as 1 gallon (7 pounds) of gas.

- Electric engine[6]- the electric engine on a hybrid vehicle is modern. Propelled gadgets enable it to go about as an engine just as a generator. For instance, when it needs to, it can draw vitality from the batteries to quicken the vehicle. Be that as it may, going about as a generator, it can back the vehicle off and return vitality to the batteries.

- Generator–The generator is like an electric engine, however it acts just to deliver electrical power. It is utilized for the most part on arrangement cross breeds.

- Batteries–The batteries in a hybrid vehicle are the vitality stockpiling gadget[7] for the electric engine. Dissimilar to the gas in the fuel tank, which can just power the gas motor, the
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electric engine on a hybrid vehicle can place vitality into the batteries just as draw vitality from them.

Transmission—The transmission on a hybrid vehicle plays out a similar fundamental capacity as the transmission on an ordinary vehicle. A few half and halves, similar to the Honda Insight, have traditional transmissions. Others, similar to the Toyota Prius, have profoundly various ones.

In this manner, the mix of six strokes and a hybrid vehicle would lead into an unprecedented motor instrument, which won't just build the current eco-friendliness, efficient altogether of the framework with respect to its individual fuel efficiencies however would likewise re-establish the whole framework regarding its mileage, power, control yield and in particular its interest.

3. PRINCIPLE

A six stroke engine portrays various extraordinary approaches in the interior ignition engine to catch the squander heat from the four stroke Otto cycle and use it to control an extra power and exhaust stroke of the cylinder. Structures either use steam or air as the working liquid for the extra power stroke. Just as removing power, the extra stroke cools the engine and expels the requirement for a cooling system making the engine lighter and giving 40% expanded productivity over the Otto Cycle. The cylinders in a six stroke motor go here and there multiple times for each infusion of fuel.

The six stroke engine has 2 power strokes[9], one fuel, one steam or air. The right now prominent six stroke engine structures incorporate “Crower's” six stroke motor, the “Bajulaz engine” and the Six-stroke engine “The Beare Head engine[10]” is known as a six stroke by its planner however stands separated from the others. It utilizes a second contradicted cylinder in each chamber which moves at a large portion of the recurrent pace of the principle cylinder, along these lines giving six cylinder developments for every cycle. It does not utilize any extra working liquid. After the fumes stroke, rather than air/fuel blend (as if there should be an occurrence of petroleum engine), outside air is sucked into the chamber from the air channel, and is expelled during the 6th stroke. The valve covers have been expelled and the extra two strokes have been accommodated better rummaging, utilizing air infusion. The engine shows 40% decrease in fuel utilization and emotional decrease in contamination. Its explicit power isn't not as much as that of a four-stroke oil engine. The engine can run on an assortment of energizes, running from petroleum and diesel to LPG. An adjusted engine shows a 65% decrease in CO contamination when contrasted and the four stroke engine from which it was created.

<table>
<thead>
<tr>
<th>Degree of shaft rotation</th>
<th>Combustion chamber 1&amp;3</th>
<th>Compressor Stroke</th>
<th>QT chamber 1&amp;3/Stroke</th>
<th>Combustion chamber 3&amp; 4</th>
<th>QT chamber 2&amp;4/Stroke</th>
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<td>Charge</td>
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4. WORKING

The workings of six stroke engine are as follows below-

First stroke (“suction stroke”) - During the principal stroke, the inlet valve opens and fuel-air blend from carburetor is drawn into the chamber through the inlet chamber.

![Figure 1 Suction Stroke of Six Stroke Engine](image1)

Second stroke (“compression stroke”) - During the subsequent stroke, cylinder moves from BDC to TDC, both the inlet valve and fumes valves are shut and air-fuel blend is compressed.

![Figure 2 Compression Stroke of Six Stroke Engine](image2)

Third stroke (“fuel power stroke”) - During the third stroke, control is gotten from the engine by lighting the air-fuel mixture utilizing a flash attachment. The two valves stay shut. Cylinder moves from Top Dead Center to Base Dead Center.

![Figure 3 Fuel Power Stroke of Six Stroke Engine](image3)

Fourth stroke (“recompression stroke”) - During the third stroke, cylinder moves from Bottom Dead Focus to Top Dead Center. Both the inlet and the fumes valves are shut. When
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cylinder arrives at Top Perfectly focused, water injector infuses water which is then changed over to steam.

![Image]

**Figure 4** Recompression Stroke of Six Stroke Engine

Fifth stroke ("steam power stroke") - During the fifth stroke, the steam starts the subsequent power stroke. The two valves stay shut. Cylinder moves from Top Dead Center to Bottom Dead Center.

![Image]

**Figure 5** Steam Power Stroke of Six Stroke Engine

Sixth stroke ("Exhaust stroke") - During the 6th stroke, cylinder moves from Bottom Dead Center to Top Right on target. The inlet valve stays shut. The fumes valve opens and the fumes gases are discharged.

![Image]

**Figure 6** Exhaust Stroke of Six Stroke Engine

5. CONCLUSION

From the above information the idea and working of the six-stroke engine can be comprehended. Six stroke engine with all the ideal characteristics[11] as better from four stroke engine will hit the market soon. Diminishing fuel utilization and contamination with no impact on execution will reassessed the idea of car. Just enhancements of the present
innovation can assist it with advancing inside sensible time and budgetary breaking points. The six-stroke engine fits consummately into this view. Its reception by the car business would have a decent sway on the earth and world economy.

REFERENCES


