Analyzing the Implementation of Six Stroke I.C. Engine with Optimal Design of Camshaft

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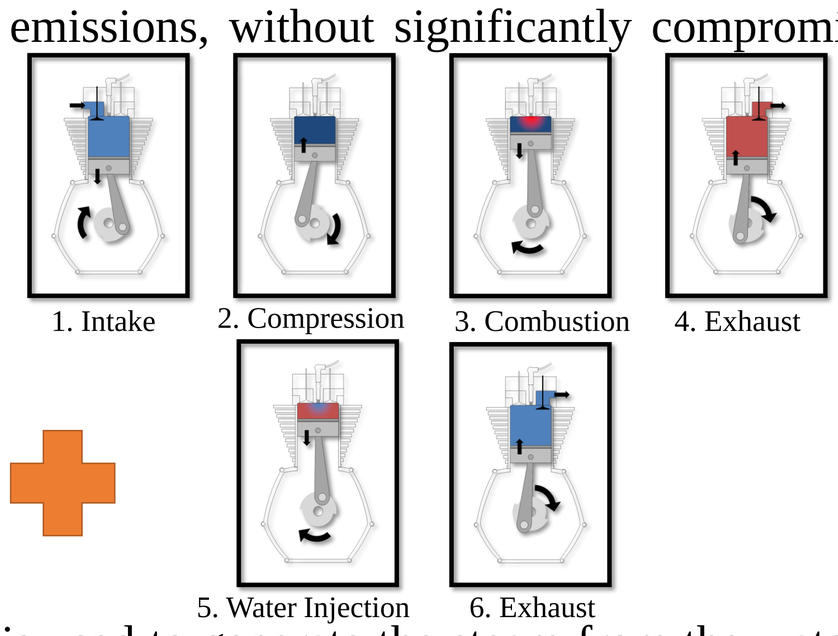
Abstract:

The aim of the presented paper is to understand the latest trends in Internal Combustion Engine while maintaining its prime focus on six stroke engines. The engine works through harnessing wasted heat energy created by the fuel combustion. After the combustion stage water is injected into the superheated cylinder. The water explodes into steam and force the piston down. It in turn helps to cool the engine. That resulted in normal levels of power but using much less fuel. It also has the advantage of not requiring an external cooling system.

Principle Working of Six Stroke Engine:

A six-stroke engine describes a number of different approaches in the internal combustion engine to capture the waste heat from the four stroke Otto cycle and use it to Power an additional power and exhaust stroke of the piston. The six-stroke engine has 2 power strokes, one fuel, one steam or air. 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 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.

Engine Modification:

To make six-stroke engine from conventional four-stroke engine, a few modifications must be done to specific parts on the conventional engine to be sure that the new engine with six-stroke will run successfully.

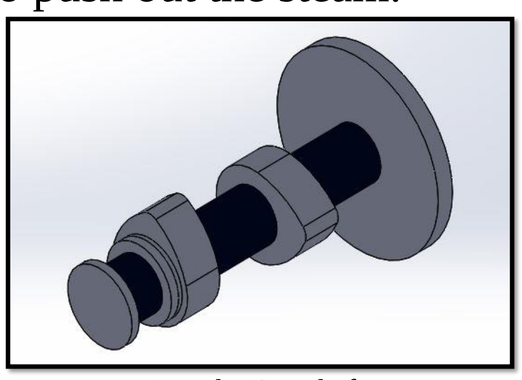
These modifications are:

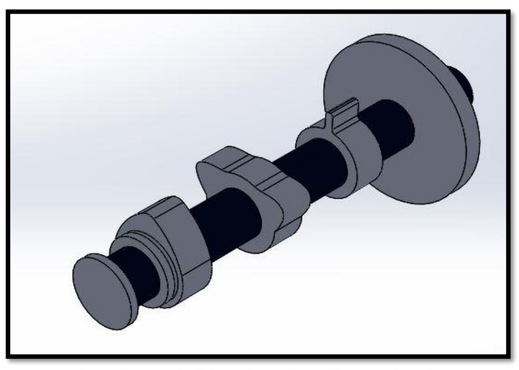
Crankshaft to Camshaft Ratio Modification

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

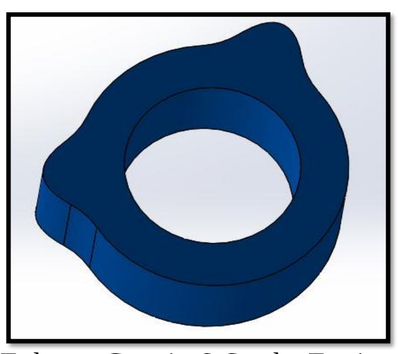
Camshaft Modification

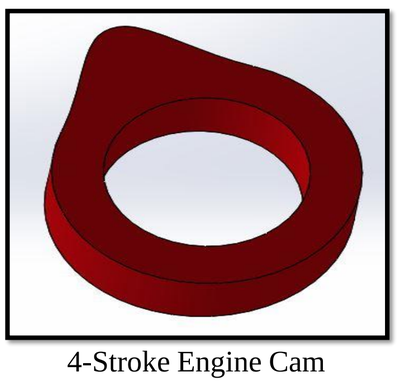
In the six-stroke engine the 360 degree of the cam has been divided into 60 degree among the six-strokes. The exhaust cam has 2 lobes to open the exhaust valve at fourth stroke (first exhaust stroke) and at the sixth stroke to push out the steam.


4-stroke Camshaft


Designed Six-Stroke Camshaft

Following changes has been made in Design of Exhaust Cam in Six-Stroke Engine. The two lobes in exhaust cam allows the camshaft to close the Exhaust valve twice, first for the fuel exhaust and then for steam exhaust.


Exhaust Cam in 6-Stroke Engine


4-Stroke Engine Cam

Conclusion:

The increased efficiency is a result of recovering heat primarily from the engine combustion gases. The recovered heat is converted to mechanical energy at the crankshaft by expanding steam in the engine combustion chamber. The poster concludes that the adoption of combined effect of a hybrid car and six stroke engine would help in the betterment of world economy as it helps in reduction of pollution and it would also support the advancement of automobile industry as it focuses on fuel efficiency which has become a prime objective in today's scenario.

In this poster the modification required to convert the four-stroke conventional engine to six stroke engine is illustrated. The modifications are the gear ratio between the crankshaft and the camshaft and modification of the cam shaft.

Future Improvement:

The prime idea is to merge the six-stroke engine along with hybrid technology. The mileage of a normal car is 11.76 kmpl i.e. it covers 100 km in 8.55 liters of gasoline on average. The hybrid car covers 100 km in 3.92 liters i.e. has a mileage of 25.52 kmpl.

But an existing hybrid car has a 4-stroke engine installed with the electric motor. If a 6-stroke engine is coupled instead of 4 stroke engine, then practically it is observed that the fuel requirement is decreased by 25% though the manufacturers claim it to be 40%.

So eventually the combo car covers 100km in 2.94 liters i.e. at an average of 34 kmpl