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Velozeta Six Stroke Engine

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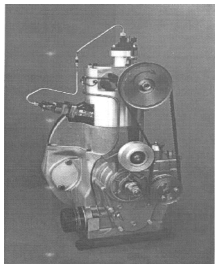
ABSTRACT:-Six stroke engine, the name itself indicates that there will be six cycling stroke out of which two are useful power stroke. According to its mechanical design, the six stroke engine with internal and external combustion and double flow similar to the actual internal reciprocating combustion engine. With a hand of that Velozeta is one of the type of six stroke engine. In Velozeta engine, fresh air is injected into the cylinder during exhaust stroke, which expand by heat and therefore forces the piston down for an additional stroke. The six stroke engine is thermodynamically more efficient. Thus the engine seems to show 40% reduction in fuel consumption dramatic reduction in air pollution, adaptability to multi fuel operation. That improves the thermal efficiency reaching up to 50% and 30% for actual internal combustion.

KEYWORDS:- Efficiency, Multi Fuel Operation, Thermodynamic, Efficient, Power.

INTRODUCTION:-

The **Six Stroke Engine** is a type of internal combustion engine based on the four stroke engine, but with the additional complexity intended to make it more efficient and reduce emissions. The term six stroke engine describes two different approaches in the internal combustion engine, developed since the early 1880s,

The pistons in this six stroke engine go up and down six times for each injection of fuel. These six stroke engines have 2 power strokes: one by fuel, one by steam or air. The currently notable six stroke engine designs in this class are the Crower's six stroke engine, invented by Bruce Crower of the U.S.A; the Bajulaz engine by the Bajulaz S A company, of Switzerland; and the Velozeta's Six-stroke engine built by the students of an engineering college Trivendrum.



SOME OF THE ABBREVIATIONS AND ACRONYMS:-

1. TFC :- Total fuel consumption in Kg/Hr

2. SFC :- Specific fuel consumption in Kg/Kwhr

3. BP :- Brake power in Kw

4. TDC :- Top dead center

5. BDC :- Bottom dead center

6. IVO :- Inlet valve opening

7. IVC :- Inlet valve closing

8. EVO :- Exhaust valve opening

9. EVC :- Exhaust valve closing

10. N :- Engine speed at final drive shaft to the wheel in rpm

11. P :- Load in Kg

12. T :- Time for 10 cc fuel consumption

HISTORY OF SIX STROKE ENGINE:-

As we all are discussing about six stroke engine, the six stroke engine are divided into two approaches as mentioned above. With lots of research on Six Stroke Engine, there are four types of engine comes under the first category of six stroke engines and two types of engine come under the second category. That we have discus

VELOZETA'S SIX STROKE ENGINE

Mechanical Engineering students of the college of Engineering in Trivandrum, in the year 2006 made this six stroke engine as a part of their B.Tech project. After the completion of the course they formed the company Velozeta with the help of state and central government. They have got the patent of this engine also.

In Velozeta's six stroke engine, a four-stroke Honda engine was experimentally altered to build the six stroke engine. The first four strokes of this engine are just like a conventional four stroke engine. The additional two strokes are for better scavenging and cooling of the engine which is provided by a secondary air induction system.

THEORY:-

There is only a slight difference between Crower's six stroke engine and Velozeta's six stroke engine. In the Crower's six stroke engine and this engine, the first four stokes are the same as a conventional four stroke engine. In Crowers engine during the fifth stroke water is injected into the cylinder and converted to steam which is used for expansion and the sixth stroke eliminates the expanded vapors through the exhaust manifold. But here the difference is that in the fifth stroke, instead of water, air from an air filter is sucked into the cylinder through a secondary air line provided at the exhaust manifold. In the sixth stroke, a mixture of this air and unburned gases are pushed out through the exhaust valve.

WORKING OF SIX STROKE ENGINE:-

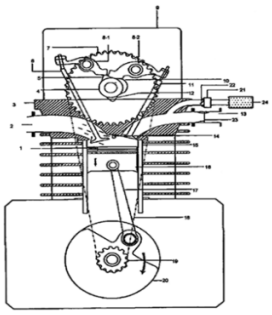
The detail working of the six stroke engine has been explained by using figures which gives explanation regarding the each stroke. A detail label of the engine parts has been given in page (4). The working of the engine is as follows. Also the detail label of engine parts in the figure is given below.

DETAIL LABEL OF ENGINE PARTS:-

1. Rings
2. Inlet Manifold
3. Cylinder Head
4. Cam shaft
5. Cam Lob No.1
6. Inlet valve
7. Sprocket 42T
8. Rocker Arm
   - 8.1. Inlet Rocker arm
   - 8.2. Exhaust Rocker arm
9. Head Cover
10. Cam Lob no.3
11. Exhaust valve
12. Cam Lob No.2
13. Exhaust Manifold
14. Spark plug
15. Cylinder
16. Piston
17. Connecting rod
18. Timing Chain
19. Sprocket 14T
20. Crank
21. Secondary air induction unit
22. Reed valve (One way valve)
23. Reed valve (One way valve in Exhaust manifold)
24. Air filter
25. 42T sprocket holder
26. Bearing

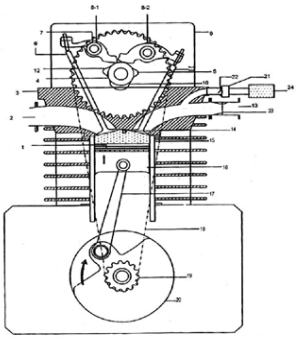
FIRST STROKE (SUCTION STROKE):-

The intake stroke happens when the piston is on its downward path with the intake valve open. This action creates suction, drawing atomized fuel, in this case gasoline mixed with air, into the combustion chamber. This is exactly the same action when liquid is drawn into a syringe. During the first stroke the inlet valve (6) opens and air-fuel mixture from carburetor is sucked into the cylinder through the inlet manifold (2).



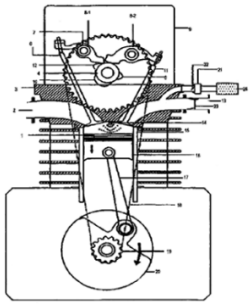
SECOND STROKE (COMPRESSION STROKE):-

The compression stroke happens as the piston begins its upward stroke with all the valves in the closed position. This compresses the air-fuel mixture causing it to become more volatile, or explosive. During the second stroke, piston moves from BDC to TDC, both the inlet valve (6) and exhaust valve (11) are closed and the air-fuel mixture is compressed. The compression ratio of the modified engine is same as that of the original four stroke Honda engine.



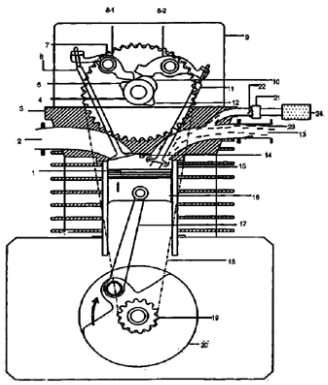
THIRD STROKE (1ST POWER OR EXPANSION STROKE):-

During the third stroke, power is obtained from the engine by igniting the compressed air-fuel mixture using a spark plug (14). Both valves remain closed. Piston moves from TDC to BDC.



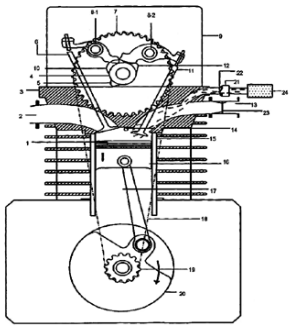
FOURTH STROKE (EXHAUST STROKE):-

During the fourth stroke, the exhaust valve (11) and the reed valve (23) opens to remove the burned gases from the engine cylinder. Piston moves from BDC to TDC.



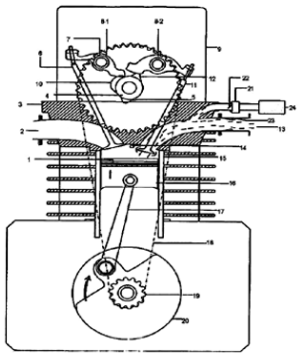
FIFTH STROKE (2ND POWER STROKE):-

During the fifth stroke, the exhaust valve (11) remains open and the reed valve (23) closes. Fresh air from the air filter (24) enters the cylinder through the secondary air induction line (21) provided at the exhaust manifold (13). The reed valve (22) opens.



SIXTH STROKE:-

During the sixth stroke, the exhaust valve (11) remains open. The air sucked into the cylinder during the fifth stroke is removed to the atmosphere through the exhaust manifold (13). The reed valve (23) opens and the reed valve (22) closes.



PERFORMANCE TEST RESULTS:-

Two tests i.e., Engine load test and Pollution, test was conducted on the six stroke engine and on the same four stroke engine from which the six stroke was developed.

EXPERIMENTAL PROCEDURE:-

The same engine was altered as four stroke and six stroke to perform the experiments. Load test and pollution test were conducted. The load test was conducted using brake drum dynamometer. The final drive shaft from the engine to the wheel was used for loading during the experiment. The engines were tested for 320rpm and 640 rpm under the same loading conditions. The time for consumption of 10cc of the fuel was noted during the experiment. The % vol. of CO in exhaust gas during idling was tested to check the pollution level of the engines. The results of load test and pollution test have been tabulated in table (1) and table (2) respectively.

LOAD TEST RESULTS:-

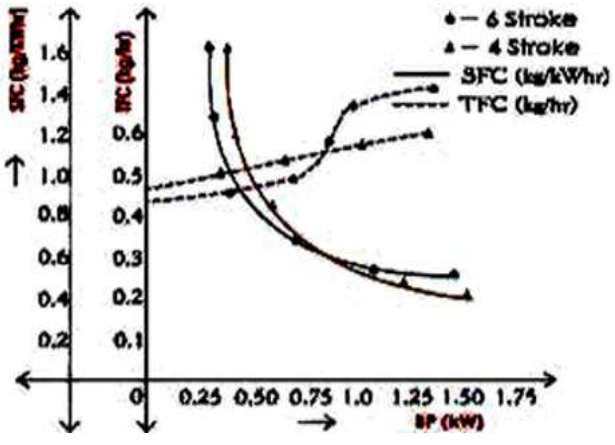
N (rpm)	P (kg)	t_4 (s)	t_6 (s)	TFC_4 (kg/hr)	TFC_6 (kg/hr)	TFC Redn. %
320	0	88	95	0.302	0.280	7.36
	4	83	92	0.321	0.289	9.81
	8	78	90	0.341	0.296	13.32
	10.5	75	84	0.355	0.317	10.72
	13.5	71	78	0.375	0.341	8.98
640	0	58	62	0.459	0.429	6.46
	4	52	54	0.512	0.493	3.70
	8	47	49	0.566	0.543	4.09
	10.5	44	39	0.605	0.683	-12.81
	13.5	42	35.5	0.634	0.750	-18.32

Table 1: Load Test

POLLUTION TEST RESULTS:-

4 stroke engine	6 stroke engine	% Pollution Redn.
0.92	**0.32**	**65.2**

GRAPHS:-



Graph-1: Bp Vs TFC & SFC at 320rpm

ADVANTAGES OF THE ENGINE :-

- Reduction in fuel consumption
- Dramatic reduction in pollution normally up to 65%
- Better scavenging and more extraction of work per cycle
- Lower engine temperature - so , easy to maintain the optimum engine temperature level for better performance
- Less friction – so , less wear and tear
- The six-stroke engine does not require any basic modification to the existing engines. All technological experience and production methods remain unaltered
- Higher overall efficiency

CONCLUSION:-

There is, at this day, no wonder solution for the replacement of the internal combustion engine. Only improvements of the current technology can help it progress within reasonable time and financial limits. The six-stroke engine fits perfectly into this view. Its adoption by the automobile industry would have a tremendous impact on the environment and world economy, assuming up to 40% reduction in fuel consumption and 60% to 90% in polluting emissions, depending on the type of the fuel being used. Better fuel economy and cleaner burning Longer service intervals and considerably reduced tooling costs when compared with a conventional OHC four-stroke design Torque is increased by 35% and efficiency increased by the same. This can be achieved by simply unbolting an existing head of a four-stroke engine and then bolting on a Bearer Head. 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

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