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Performance Analysis of Two Stroke Petrol Engine On The Basis Of Variation in Carburetor Main-Jet Diameter

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Abstract

Atwo stroke engine is one which completes its cycle of operation in one revolution of the crankshaft or in two strokes of the piston. In many two stroke engines the mechanical construction is greatly simplified by using the piston as a slide valve in conjunction with intake and exhaust ports cut on the side of the cylinder. A carburetor is that part of a gasoline engine which provides assimilation air-fuel mixture as and when required. The author have used single cylinder two stroke experimental way. A driver controls the engine speed by increasing or reducing the amount of fuel with the help of accelerator pedal. The experimental results show that which size of main jet gives better result under various load and gear operating condition.

Key words— carburetor, engine test rig, gear ratio, load, two stroke petrol engine,

I. INTRODUCTION

Two stroke petrol engines are widely used for two wheelers as a source of mechanical power . Various designs are available for two stroke petrol engine for variety of automotive applications. A two-stroke engine works by using an up stroke and down stroke of the piston to complete the process cycle in one revolution of the crankshaft. This is accomplished with the use of both the end of the combustion stroke and the beginning of the compression stroke to simultaneously perform the intake and exhaust functions, also known as scavenging. This engine is air-cooled and design is based on aerodynamic application special engine fixing arrangement is made for testing purpose. Engine is coupled to rope brake dynamometer through Universal joints. Four speeds are available on engine so that wide speed variation is possible. Air-inlet quantity is measured through orifice meter and air tank. Air tank is designed considering the pulsating flow characteristics of two stroke engine.

Volumetric efficiency of the engine can be measured. Special accelerator level arrangement is used to lock the accelerator cable at specific position by locking nut. So that constant speed can be maintained. Temperature at engine exhaust gas, calorimeter inlet and outlet can be measured by Thermocouple type Temperature sensor with digital indicator. Water inlet and outlet temperature at calorimeter is measured by mercury thermometer. In which the researcher change main jet of carburetor follow above all condition by changing different size i.e. 85, 90 95 respectively

II. PREVIOUS RESEARCH

Many techniques have been followed by researchers to conduct the performance analysis of two stroke petrol engine employed in various parameters. G. Ciccarelli et al. [1] the novelty of engine lies in the cylinder head that contains multiple check valves that control scavenging airflow into the cylinder from a supercharged air plenum. R. Mikalsenet et al.[2] design of a modular compression ignition free piston engine generate, applicable to electric power generation in large-scale system. Jesus Benajes et al. [3] results confirm how that engine architecture presents high flexibility in terms of air management control to substantially affect the in-cylinder condition. J. Galindo et al. [4] detailed methodology for heat release deternation in two stroke engine under a wide range of running conditions; obtained empirical data will serve for building ad-hoc wiebe function whose four parameters will be finally correlated with engine related parameter derived from 1D simulations. BehrouzChehroudi et al [5] velocity information was collected from an intake port of a single cylinder piston ported two stroke engine by a laser Doppler velocimetric(LDV) system to better understand and quantify the behavior of intake flow exiting into the cylinder during the scavenging process. DeepalBharadwaj et al. [6] two stroke engine was developed to obtain a greater output from same size of engine. The engine mechanism eliminates the valve arrangement making mechanically simpler. Theoretically a two stroke engine developed twice the power of a comparable four stroke engine, thus making it more compact. S.Kumarappa et al. [7]direct injection system was developed which eliminates short circuiting losses completely and injection timing was optimized for the best engine performance and lower emission. Dr. A. Srinivas et al. [8] deal with design, analysis testing at different compression rations, modification and engine fabrication. It is observed that the increase in compression ratio improve fuel efficiency and power output

III. SPECIFICATIONS OF

EXPERIMENTAL TWO STROKE PETROL ENGINE

1. Rated power output: - 5HP at 4000 rpm
2. Rated RPM at Crankshaft :- 4000
3. No. Of Cylinder :-ONE
1. Stroke :-57mm.
2. Bore :-57mm.
3. No. Of reductions through Gearbox :-4
4. Swept volume :-145.45
5. Compression ratio :-7.4:1
6. Reduction ratio :-FOUR

a. 1st Gear :-14.47=1
b. 2nd Gear :-10.28=1
c. 3rd Gear :-7.31=11
d. 4th Gear :-5.36=1

7. Type of Dynamometer:-Rope break type
8. Sp. Weight of fuel :-780 kg/m3
9. Fuel oil : - Petrol
10. Orifice Diam. of air measurement:-12mm.
11. Fuel oil tank Capacity:-7 liter
12. Temperature indicator:-Digital type (5 stage)
13. Outer Diam. Of Drum:-770mm.
14. Rope Thickness :-25mm.
15. Length :-2500mm
16. Width :-1400mm
17. Height :-2000mm

IV. METHODOLOGY

Petrol engine is tested for the performance calculations. The testing is carried out at various loads starting from no load condition to rated full load conditions. The tests are conducted at constant speed condition. Accelerator of the engine will adjust the engine speed nearly equal the rated RPM of the engine. There is four speed gearboxes and output of the gearbox is coupled to Dynamometer through carbon shaft. Engine is started by kick-start when gear is at neutral position. Ignition switch is provided on the board to stop the engine. When engine is started at neutral position of gearbox there will be no movement of carbon shaft. Run the engine for three minutes at neutral position and then shift the gear at the 4th speed. Note the carbon shaft (Propeller shaft) RPM by tachometer arrangement at Dynamometer shaft. Adjust the RPM by accelerometer by locking nut and run the engine for ten minute at no load condition of Dynamometer. Fill the burrette on the fuel supply line and measure the time required for 5 cc petrol consumption. Adjust the load by rope brake dynamometer record all temperature, quantity of water through calorimeter with the help of water meter record the speed and repeat the same for 0,1/4 ,1/2 ,3/4 and full load. Researcher repeats the experiment for various output speed with accelerometer by applying different load i.e. 0.5,10. This experiment is taken in different gear ratio i.e. 1 to 4 by changing different main jet carburetor size 85, 90, 95. Then draw the table of all the reading taken by this experiment.

Figure 1, Gear test rig

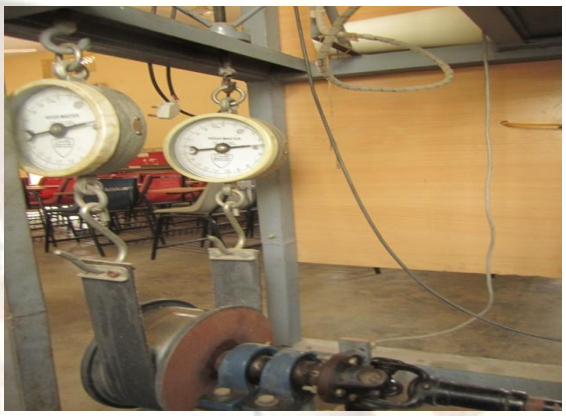

Figure 2, Load

Figure 3, Engine test rig

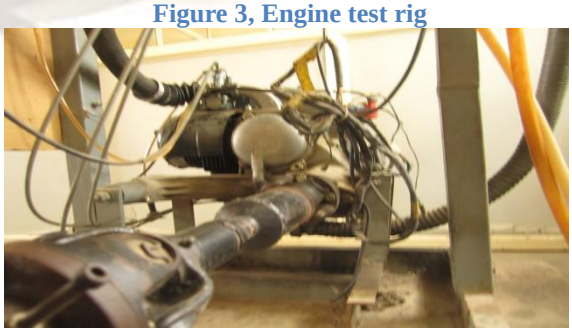

Figure 4, Two stroke petrol engine test rig

GEAR	RPM	LOAD (in K.G)	Time Taken for 5cc consumption of fuel (in Sec)	T1(water inlet temperature)	T2(water outlet temperature)	T3 (exhaust inlet temperature)	T4 (exhaust outlet temperature)
1st gear	249	0	**30.25**	33.5	33.6	43.6	36.5
2nd gear	407	0	27.57	33.5	33.6	46.6	36.8
3rd gear	551	0	26.64	33.5	33.7	47.6	37.1
4th gear	683	0	25.14	30.4	31.1	43.2	34.8
1st gear	237	5	27.25	33.5	33.6	44.2	36.9
2nd gear	385	5	26.18	33.5	33.8	44.1	37.7
3rd gear	471	5	27.41	33.6	33.9	48.4	37.6
4th gear	528	5	**28.12**	30.4	31.0	43.0	34.9
1st gear	228	10	26.42	33.6	33.7	44.5	37.1
2nd gear	295	10	29.27	33.6	33.8	43.2	37.0
3rd gear	377	10	26.44	33.6	33.9	44.6	37.5
4th gr	370	10	**32.61**	30.5	30.9	43.5	34.7

Table 1, Experimental result with main jet of carburetor size 85

GEAR	RPM	LOAD (in Kg)	Time Taken for 5cc consumption of fuel (in Sec)	T1(water inlet temperature)	T2(water outlet temperature)	T3 (exhaust inlet temperature)	T4 (exhaust outlet temperature)
1st gear	224	0	36:24	27.0	27.3	39.4	30.1
2nd gear	380	0	35:54	27.0	27.6	41.4	31.3
3rd gear	536	0	**37:00**	27.1	27.5	42.8	31.8
4th gear	640	0	36:26	27.1	27.5	42.8	31.8
1st gear	150	5	37:21	27.1	27.3	35.0	30.2
2nd gear	197	5	41:52	27.1	27.4	35.5	30.1
3rd gear	185	5	56:55	27.2	27.5	35.4	30.6
4th gear	232	5	**58:60**	27.2	27.4	35.1	30.3
1st gear	129	10	40:95	32.8	33.0	38.6	35.9
2nd gear	157	10	**47:70**	32.9	33.1	38.4	36.2
3rd gear	180	10	42:86	33.1	33.1	38.5	36.2
4th gear	172	10	47:52	33.0	33.2	38.0	36.3

Table 2, Experimental result with main jet carburetor size 90

Figure 5, Number of jet

Figure 6, Main jet

V. RESULTS

1. At carburetor main jet size 85 we get-

A. At 0 kg. Load the minimum time taken for 5 cc. consumption of fuel is 30:25 (second: mili sec.) at 249 engine RPM in 1st gear.

B. At 5 kg. Load the minimum time taken for 5 cc. consumption of fuel is 28:12 (second: mili sec.) at 528 engine RPM in 4th gear.

C. At 10 kg. Load the minimum time taken for 5 cc. consumption of fuel is 32:61 (second: mili sec.) at 370 engine RPM in 4th gear.

2. At carburetor main jet size 90 we get-

A. At 0 kg. Load the minimum time taken for 5 cc. consumption of fuel is 37:00 (second: mili sec.) at 536 engine RPM in 3rd gear.

B. At 5 kg. Load the minimum time taken for 5 cc.consumptionof fuel is 58:60 (second: mili sec.) at 232 engine RPM in 4th gear.

C. At 10 kg. Load the minimum time taken for 5cc. consumpation of fuel is 47:70(second: mili. Sec.) at 157 engine RPM in 2nd gear.

3. At carburetor main jet size 95, We get-

GEAR	RPM	LOAD (in Kg)	Time Taken for 5cc consumption of fuel (in Sec)	T1(water inlet Temperature)	T2(water outlet temperature)	T3 (exhaust inlet temperature)	T4 (exhaust outlet temperature)
1st gear	240	0	**28:27**	31.0	31.3	40.3	34.3
2nd gear	386	0	25:73	31.0	31.4	40.7	34.3
3rd gear	548	0	27:19	31.0	31.4	41.8	34.7
4th gear	682	0	26:95	31.1	31.6	41.9	35.21
1st gear	235	5	31:64	31.1	31.5	42.5	35.1
2nd gear	307	5	33:63	31.2	31.5	41.9	35.1
3rd gear	405	5	**35:27**	31.1	31.5	42.3	35.3
4th gear	485	5	34:74	31.2	31.5	43.4	35.5
1st gear	232	10	26:95	31.1	31.2	41.9	34.4
2nd gear	271	10	29:34	31.1	31.2	40.5	34.0
3rd gear	300	10	37:85	31.2	31.4	41.9	34.5
4th gear	295	10	**44:00**	31.2	31.5	40.6	34.4

A. At 0 kg. Load the minimum time taken for 5 cc. consumption of fuel is 28:27 (second: mili sec.) at 240 engine RPM in 1st gear

B. At 5 kg. Load the minimum time taken for 5 cc. consumption of fuel is 35:27 (second: mili sec.) at 405 engine RPM in 3rd gear.

C. At 10 kg. Load the minimum time taken for

5 cc. consumption of fuel is 44:00 (second: mili sec.) at 295 engine RPM in 4th gear.

VI. CONCULSIONS

The significant conclusions from the present work are summarized as follow-

1. For better fuel consumption by which we get good average At 5 kg. Load the minimum time taken for 5 cc. consumption of fuel is 58:60 (second: mili sec.) at 232 engine RPM in 4th gear in main jet size 90 compare to other.
2. For get more RPM under the load condition we use. At 5 kg. Load the minimum time taken for 5 cc. consumption of fuel is 28:12 (second: mili sec.) at 528 engine RPM in 4th gear in main jet size 85 in compare to other.

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