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"PERFORMANCE ANALYSIS OF SINGLE CYLINDER FOUR STROKE ENGINE USING SWIRL CHAMBER INTAKE SYSTEM"

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Abstract – *A good swirl promotes the fast combustion and improves the efficiency. The need of automobile vehicles, still satisfying demands for high performance, necessitates immense efforts to develop innovative engine concepts and produce less emission. The fluid flow analysis plays an important role for air-fuel mixture preparation to obtain the better engine combustion, performance and efficiency. This study is about the effects of air swirl in the cylinder on its performance. Here a single cylinder S. I. engine is used for study. In this present work, a study about influence of the air swirl upon the performance and emission of a single cylinder four stroke petrol engine is presented.*

Key Words: **Swirl Chamber, Manifold, A/F mixture, Emission.**

1. INTRODUCTION

Swirl is defined as the large scale vortex in the in-cylinder fluid with the axis of rotation parallel to the piston axis. Swirl, considered as a two-dimensional solid body rotation, persists through the compression and combustion processes. Swirl is one of the principal means to ensure rapid mixing between fuel and air, and is used in gasoline engines to promote rapid combustion. The swirl level at the end of the compression process depends upon the swirl generated during intake process and how much it is amplified during the compression process. The decay of swirl in an engine cylinder during the compression process is relatively small so that the Overall angular momentum of the swirl vortex is almost conserved.

2. LITERATURE REVIEW

[1] From this paper we found that the performance of engine is improved by introducing the swirl chamber. In order to achieve swirl, diverting tube is used between carburetor and engine to intensify the swirl for the better mixing of fuel and air. A good swirl promotes the fast combustion and improves the efficiency.

[2] From this paper we came to know that, the fluid flow analysis plays an important role for air-fuel mixture preparation to obtain the better engine performance at the extreme conditions inside an IC engine. Computational Fluid Dynamics (CFD) offers the opportunity to carry out repetitive parameter studies with clearly defined boundary conditions in order to investigate various configurations.

[3] From this paper we found that the performance of engine is improved by introducing the swirl chamber. In order to achieve swirl, exhaust of engine is reduce.

[4] In this paper we found that, by obtaining different swirl intensities the following design parameters have been changed such as piston crown, cylinder head and inlet duct. By changing the piston crown design the enhancement in the turbulence inside the cylinder is achieved. Also grooves are made to achieve the increase in swirl intensities for better mixing of fuel and air.

3. EXPERIMENTAL SETUP

Fig.1 is a schematic of arrangement used for modification in air intake manifold system. The intake manifold is modified to get proper Air Fuel mixture. In the modification the swirl chamber with curved baffles inside is made to get proper amount of Air Fuel mixture. The baffles are allowing a streamline air flow inside the chamber. The diverter tube is made up of ABS-Polymer.

Fig.1 Schematic diagram

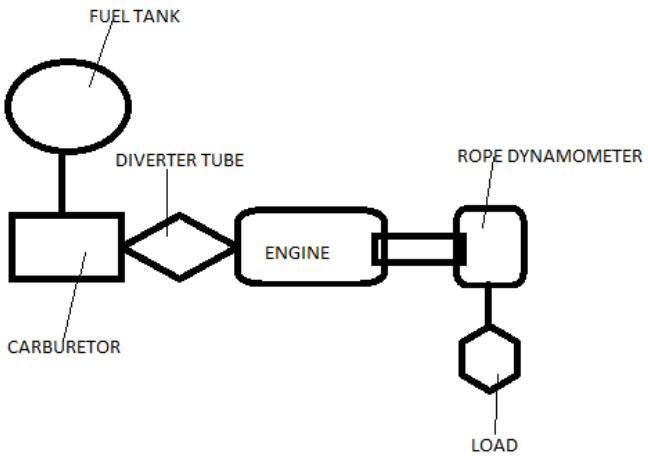
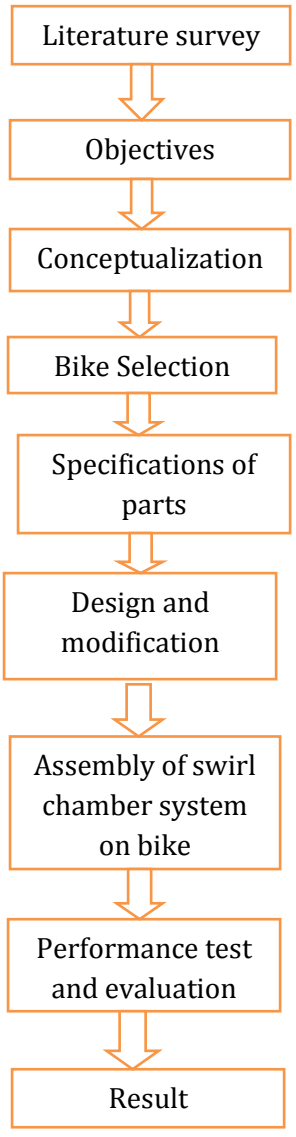


Table no.1 Engine Specifications:

Engine	
Type	Air cooled , 4 stroke single Cylinder
Bore	50mm
Stroke	49.5mm
Piston Displacement	97.2
Carburetor	Side Draft, Variable Type with TCIS
Compression Ratio	9:9:1
Transmission	
Clutch	Multiple Wet
Transmission	4 Speed constant mesh
Gear shift pattern	All down , heel-toe shift
Performance	
Max. Horsepower	6.15kW(8.36 Ps)@8000rpm
Max. Torque gear	0.82Kg – m (8.05 N-m)@5000rpm

4. METHODOLOGY



5.OBSERVATION TABLE:

Without swirl Chamber:

Load (kg)	Speed (RPM)	B.P. (W)	(h_1-h_2) Cm	Vol^m Eff. (%)	BSFC Kg/BHP-hr	n_{bt} (%)
2	2737	143.30	0.50	67.73	0.5502	10.94
3	2610	204.98	0.58	76.49	0.3901	15.43
4	2500	261.79	0.61	81.90	0.32	18.81
5	2450	320.70	0.68	87.58	0.2830	21.27

With Swirl Chamber:

Load (kg)	Speed (RPM)	B.P. (W)	(h_1-h_2) Cm	Vol^m Eff. (%)	BSFC Kg/BHP-hr	n_{bt} (%)
2	2957	154.82	0.59	72.56	0.4494	13.398
3	2775	217.94	0.65	78.34	0.3220	18.70
4	2698	282.53	0.71	83.86	0.2640	22.80
5	2560	335.10	0.75	88.68	0.2331	25.81

6. RESULT AND CONCLUSION:

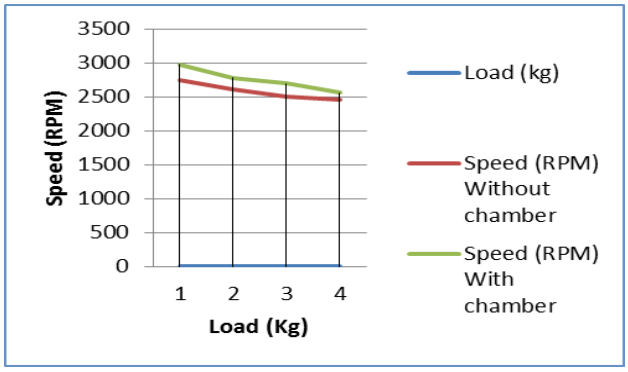


Chart No.1 : Load vs Speed

Chart 1 indicates that as the load increases the speed of engine decrease. At specific load the speed of engine with the diverter tube is more as compared to speed of engine without diverter tube.

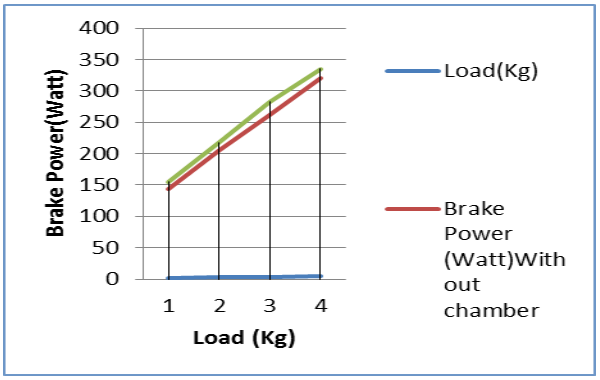


Chart No.2 Load vs Brake power

Chart 2 indicates that with increase in load the brake power increases. At the specific load brake power with swirl chamber is more as compared to without swirl chamber.

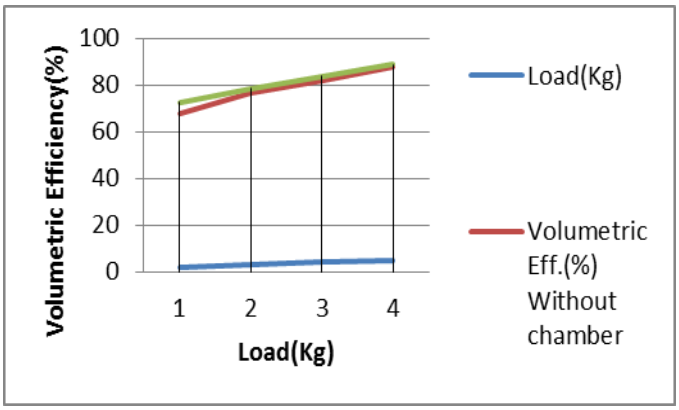


Chart No.3 Load vs Volumetric Efficiency

Chart 3 indicates that with increase in load the volumetric efficiency increases. At the specific load volumetric efficiency with swirl chamber is more as compared to without swirl chamber.

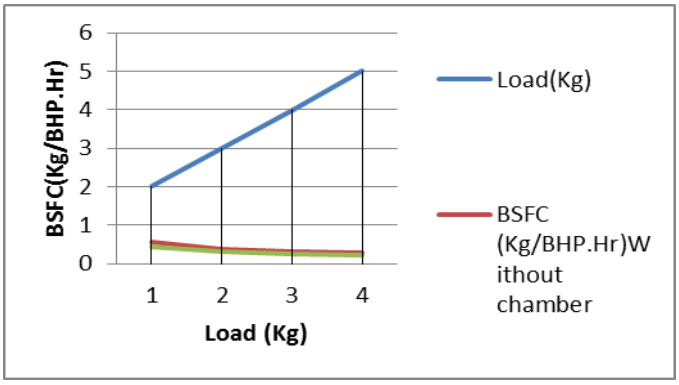


Chart No.4 Load vs Bsfc

Chart 4 indicates that with increase in load the Bsfc decreases. At the specific load Bsfc with swirl chamber is less as compared to without swirl chamber.

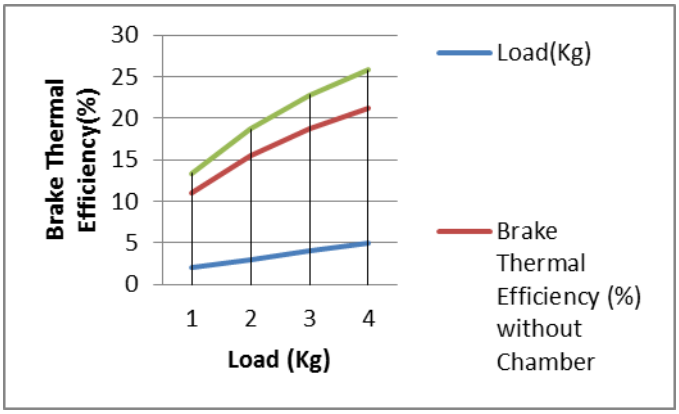


Chart No.4 Load vs Brake thermal efficiency

Chart 5 indicates that with increase in load the Brake thermal efficiency increase. At the specific load Brake thermal efficiency with swirl chamber is more as compared to without swirl chamber.

7. CONCLUSION

The main objective of swirl chamber is to supply even distribution of air and fuel mixture to intake system. In case of Swirl chamber is to supply uneven distribution, it lead to decrease in volumetric efficiency. The main objective of project is to increase performance of engine by designing the swirl chamber. Due to the swirl chamber the mixture of air and fuel from carburetor to engine is properly mixed. Due to this proper combustion of fuel take place and emission is reduce as well as performance of engine is increase.

8. REFERENCE

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