EFFECT OF MASKING ON INLET POPPET VALVE AND PERFORMANCE CHARACTERISTICS ON 4-S SINGLE CYLINDER DIESEL ENGINE

[1]Mahesh G,[2]Dr.Hiregoudar Yerrennagoudar,[3]A V Goutham Rao, [4]B S Prem Sagar
[1]Assistant Professor, [2]Profesor, [3]Student, [4]Student
[1]Department of Mechanical Engineering,
[1]RYMEC, Ballari, Karnataka, India

Abstract : Optimizing airflow performance during intake valve process is the main purpose for this project. Experimental analysis were done using a test rig single cylinder 4 stroke direct injection diesel engine. This analysis also reported and compared with both analyses where experimental result can meet a nearly required targeted limit due to some realistic condition. Fabrication of intake valves also were made to do analysis on experimental based on the modify design. This analysis could be used to increase thermal efficiency and maximizing usage of air fuel in combustion process, which reduce pollution to environment. Even though air flow have been optimized on its intake valve, but still intake system could be improve by considering other parts of engine such as intake manifold.

IndexTerms **– Air flow, Valve, Manifold.**

I. INTRODUCTION

Compression-ignition (CI) or diesel engines are widely used for transportation, agriculture applications and industrial sectors because of their high fuel conversion efficiencies and easy operation. The existing CI engines operate with conventional diesel fuel derived from crude oil. It is well known that the world petroleum resources are limited and the production of crude oil is becoming more difficult and expensive. On the other hand, the pollutants including unburned hydrocarbons (UHCs), carbon monoxide (CO), nitrogen oxides (NOx) and smoke opacity emissions have been regulated by laws in many countries. Recently, changing the engine-operating parameters, such as valve timing, injection timing, and atomization ratio, has been carried out in many studies on the CI engines aiming to increase the performance and reduce the emissions.

II. MASKING OF INLET POPPET VALVE

Normal Inlet Poppet Valve

The Conventional Inlet Poppet Valve or Normal Inlet Poppet valve. Consisting of combustion face which is exposed to a very high temperature during the process of combustion. Valve is having a delicate part called seating which should be very accurate enough in dimensions and finishing so that accurate locking and sealing enhances the whole engine performances.

Two Mask Inlet Poppet Valve

In this type of design there is a combination of 2 small additions of pieces called Mask which are opposite to each other at certain angle to 90^0.

Four Mask Inlet Poppet Valve

In this type of design there is a combination of 4 small additions of pieces called Mask which are placed to the four sides of the inlet poppet valve at certain angle to 90^0.

III. METHODOLOGY

- Study of performance of 4-stroke single cylinder diesel engine is carried out by using 3 hole fuel injector nozzle and by using diesel as a fuel with masking on inlet poppet valve.
- Diesel is used as fuel in a VCR engine. The performance characteristics of the engine were measured under varying load conditions and crank angle.

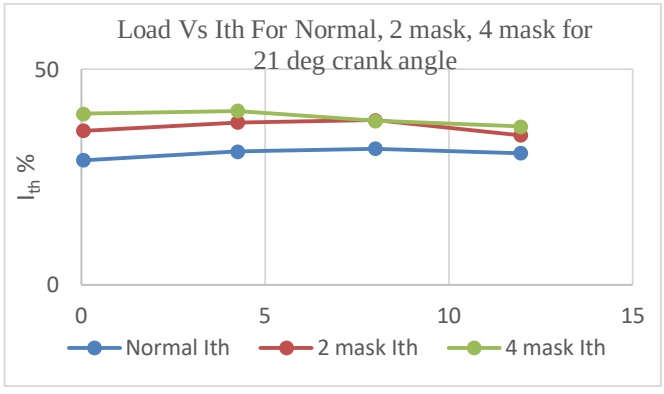
IV. OBJECTIVES

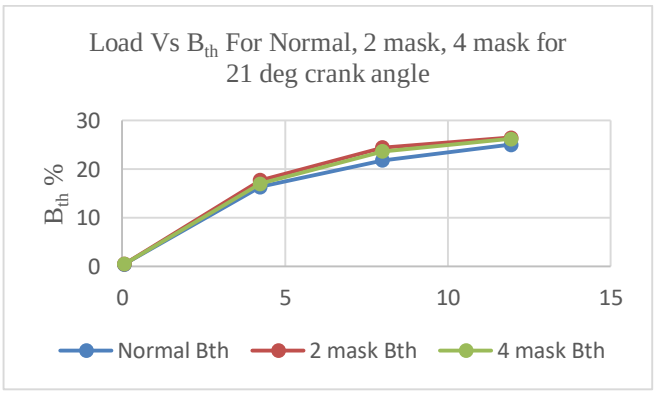
- To study the performance of 4-stroke single cylinder diesel engine with 3 hole nozzle and diesel as fuel with masking on inlet poppet valve under varying load conditions.
- To study the performance of 4-stroke single cylinder diesel engine with 3 hole injector nozzle and diesel as a fuel with masking on inlet poppet valve by varying crank angle.

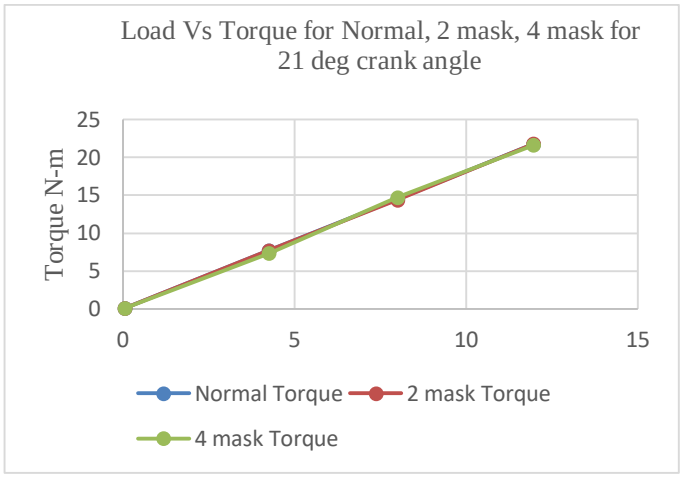
V. EXPERIMENTAL SETUP

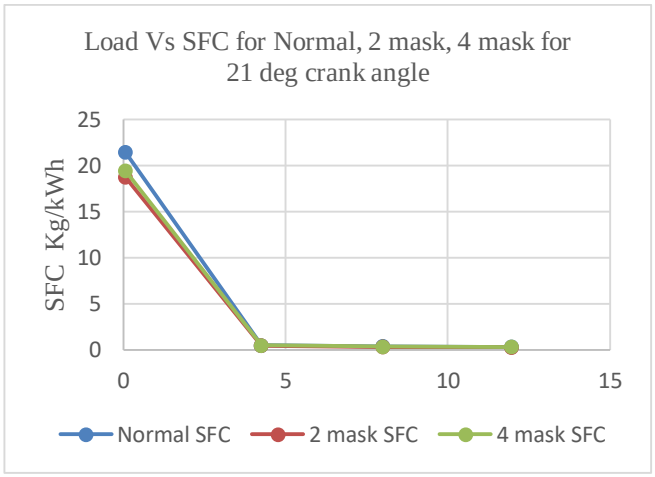
Make- Kirloskar, Power-3.50Kw, Speed-1500 rpm, No. of Cylinder-1 (Single Cylinder), No. of Stroke-4-Stroke,Type of Cooling-Water Cooled, Fuel-Diesel, Cylinder Bore-87.50mm, Stroke Length-110mm, Connecting Rod Length-234mm,Compression Ratio-18.00, Swept Volume-661.45cc.

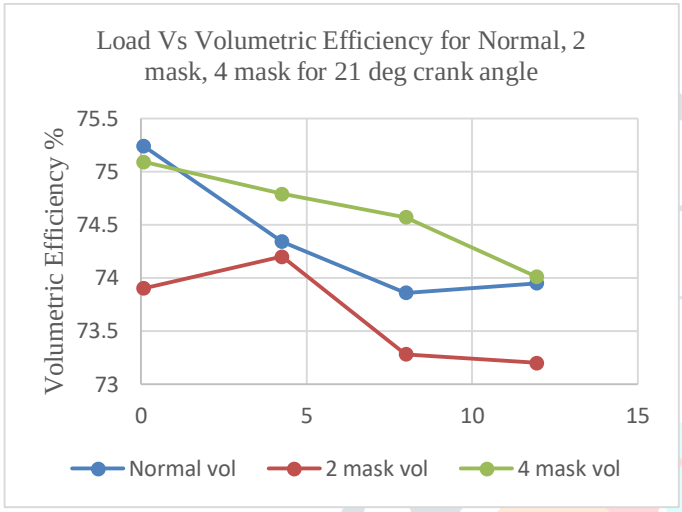
VI. RESULTS AND DISCUSSIONS

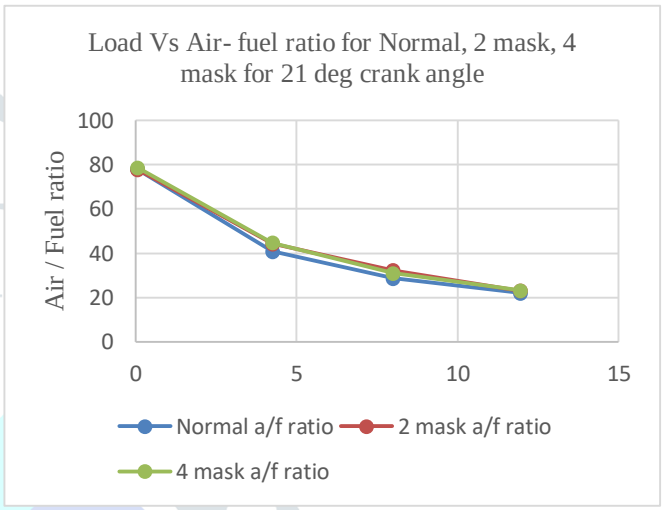


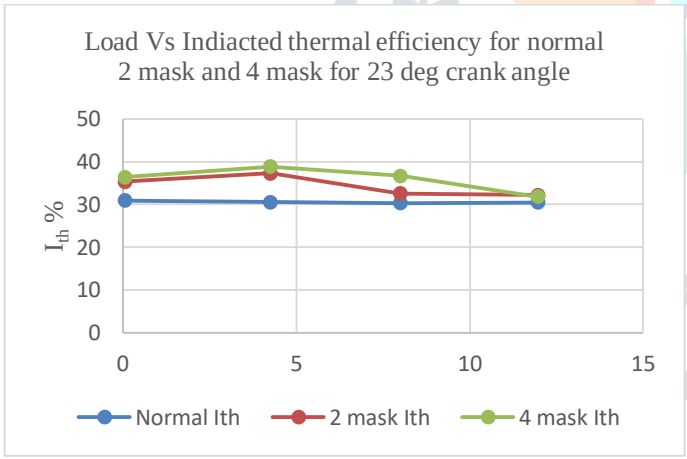


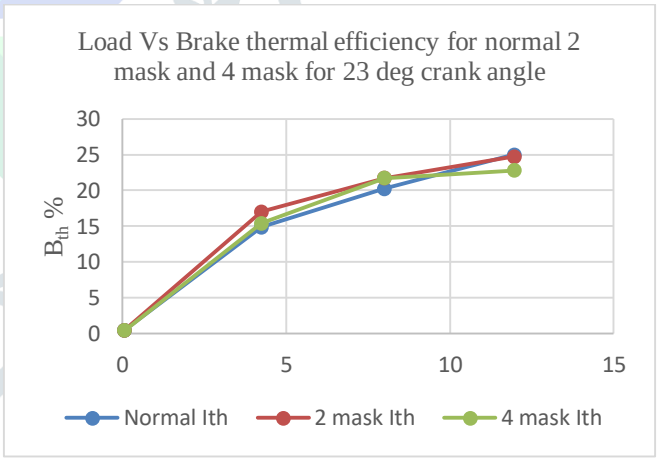

Load Vs Torque for Normal, 2 mask, 4 mask for 21 deg crank angle
Torque N-m
25
20
15
10
5
0
0
5
10
15
Normal Torque
2 mask Torque
4 mask Torque

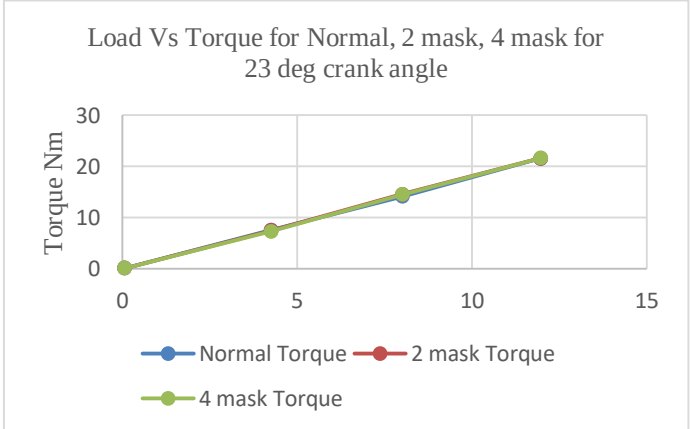

Load Vs SFC for Normal, 2 mask, 4 mask for 21 deg crank angle
SFC Kg/kWh
25
20
15
10
5
0
0
5
10
15
Normal SFC
2 mask SFC
4 mask SFC

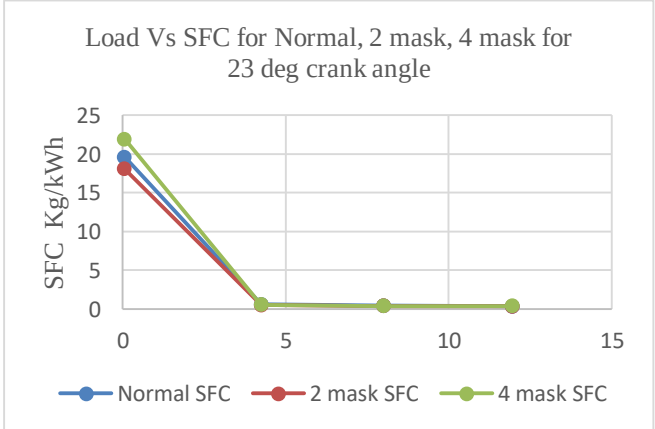

Load Vs Volumetric Efficiency for Normal, 2 mask, 4 mask for 21 deg crank angle
Volumetric Efficiency %
75.5
75
74.5
74
73.5
73
0
5
10
15
Normal vol
2 mask vol
4 mask vol

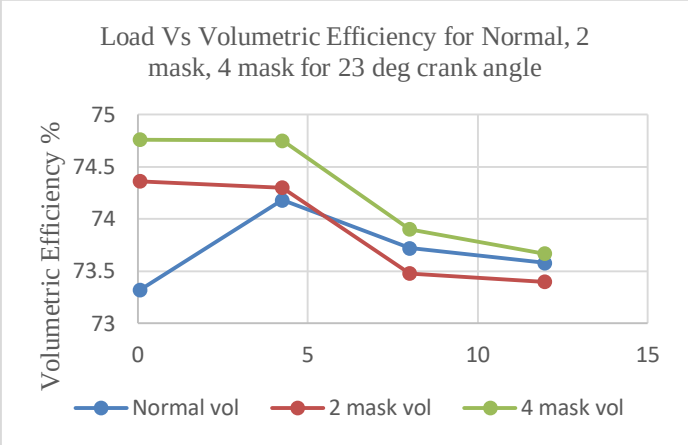

Load Vs Air- fuel ratio for Normal, 2 mask, 4 mask for 21 deg crank angle
Air / Fuel ratio
100
80
60
40
20
0
0
5
10
15
Normal a/f ratio
2 mask a/f ratio
4 mask a/f ratio

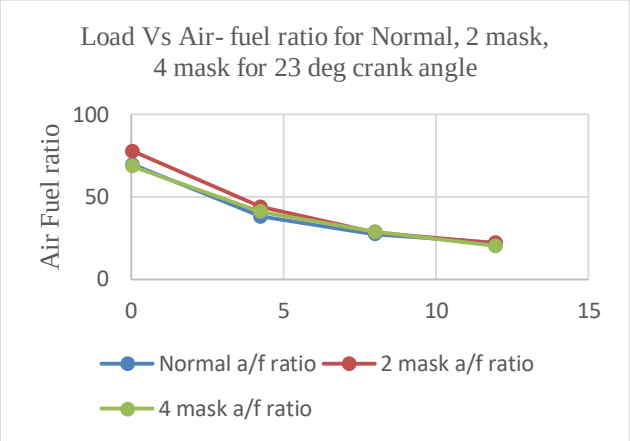

Load Vs Indiacted thermal efficiency for normal 2 mask and 4 mask for 23 deg crank angle
Ith %
50
40
30
20
10
0
0
5
10
15
Normal Ith
2 mask Ith
4 mask Ith


Load Vs Brake thermal efficiency for normal 2 mask and 4 mask for 23 deg crank angle
Bth %
30
25
20
15
10
5
0
0
5
10
15
Normal Ith
2 mask Ith
4 mask Ith


Load Vs Torque for Normal, 2 mask, 4 mask for 23 deg crank angle
Torque Nm
30
20
10
0
0
5
10
15
Normal Torque
2 mask Torque
4 mask Torque


Load Vs SFC for Normal, 2 mask, 4 mask for 23 deg crank angle
SFC Kg/kWh
25
20
15
10
5
0
0
5
10
15
Normal SFC
2 mask SFC
4 mask SFC





VII. Conclusion

- It was found that Indicated Thermal Efficiency of 4 mask valve for 21 and 23 CA is maximum. 4 mask valve at 21º CA is increased by 7.19%.
- Brake Thermal Efficiency of 4 mask valve for 21 and 23 CA is maximum. 4 mask valve at 21º CA is increased by 3.86%.
- Specific Fuel Consumption of 2 mask valve for 21 and 23 CA is less fuel consumption. 2 mask valve at 23º CA is reduced by 0.838.
- Volumetric Efficiency of 4 mask valve for 21 and 23 CA is maximum. 4 mask valve at 21º CA is increased by 0.345%.

VIII. References

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