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Turbocharged 2-Stroke Single Cylinder 98.2cc Si Engine

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ABSTRACT

To start with, a study on the effect of turbocharger on a single cylinder 2-stroke engine is made. The design and installation of turbocharger in a engine is available in this work. We have design and fabricated a prototype of turbocharger which was implemented in 2-stroke engine, In which the efficiency of the engine will be increased. volumetric efficiency of a S.I. Engine will be increased and proper scavenging will be done by providing combustion chamber with maximum amount of air.

Keywords : Turbocharger, 98.2cc, 2-stroke engine, scavenging, volumetric efficiency, gasoline.

I. INTRODUCTION

The turbocharger is being driven by a gas turbine using the energy in exhaust gases. The main parts of turbocharger are turbine wheel, turbine housing, turbo shaft, compressor wheel, compressor housing & bearing housing.

A 2-stroke S.I. Engine is an engine that uses gasoline as fuel. S.I.engine is a spark ignited engine that is the combustion is carried out by spark ignition, it is achieved by installation of spark plug on cylinder head.
The strokes on which it works are: Suction, Compression, and Power/Working Stroke & Exhaust Stroke. The power produced by engine is only obtained in Power stroke.

When a gas is compressed, its temperature increases. It is not rare for a turbocharger to be pushing out air that is 95 °C. Compressed air from a turbo may be cooled before it is served into the cylinders, using an intercooler or a charge air cooler.

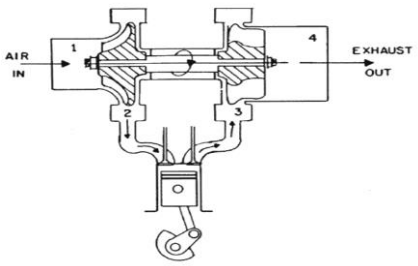

Figure 1. Layout of turbocharger with engine.

A turbo rotations very fast maximum peak between 80,000 and 150,000 rpm depending on size, weight of the rotating parts, boost pressure established and compressor design.

Figure 2. Turbocharger

About Project

Usually turbocharger is used for the purpose of increasing efficiency and power. It increases efficiency and reduces the exhaust emission, here we are making the 2-stroke turbocharged engine for more efficient by increasing efficiency, better scavenging and decreasing exhaust emissions.

Figure 3. Installed Turbocharger system in 2-stroke bike.

Our purpose is to selecting this project for improving efficiency of 2-stroke engine. It is also good with regard to economic considerations and scavenging process. Here the measured Vehicular Exhaust emission are Carbon monoxide (CO), Hydro carbon (HC), Carbon dioxide (CO) and Oxides of Nitrogen (NO)] of Suzuki Max 100 engine (98.2 cc) using MEXA-584L Gas analyser for gasoline powered vehicles. The real time values were compared with standard ones, and the level qualified. Throughout half throttling about 90% of scooters and 93% of motorcycle were originate emitting HC inside the prescribed national standard of 2000 PPM. As we know that the volumetric efficiency of a S.I. Engine is increased by providing combustion chamber with maximum quantity of air. This is completed by installation of Turbocharger.

In present work we'll be increasing the volumetric efficiency and roper scavenging process of a 98.2cc single cylinder 2-stroke engine by installation of turbocharger.

To start with, a study on the consequence of turbocharger on a single cylinder 2-stroke is completed. The design and installation of turbocharger in a single cylinder 2-stroke is available in this work.

II. DESIGN OF TURBOCHARGER

Design is a grouping of analysis and creative thought. Good designs are based on special concepts and properly designed details. For designing of turbocharger components CAD software is required.

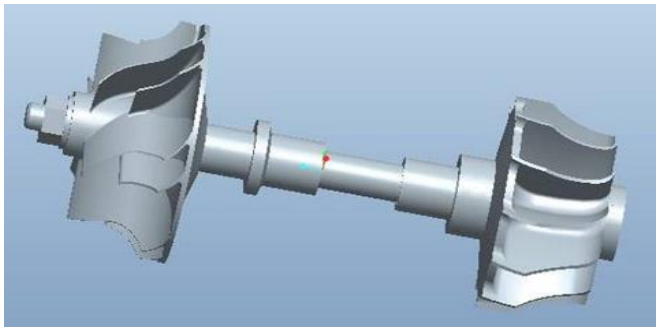

Figure 4. Designed Turbine & Comperassor

Figure 5. Design Turbocharger

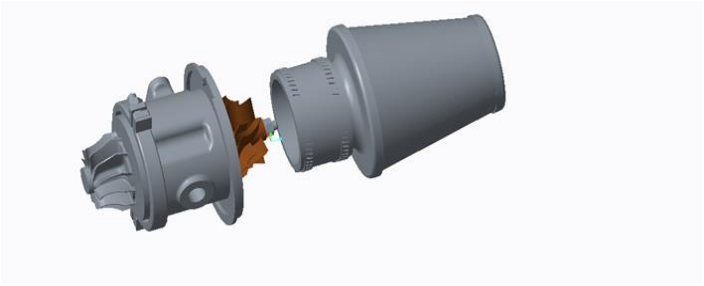

Figure 6. Design comperessor and turbine with air filter

III. ENGINE & TURBOCHARGER ANALYIS

Table.1:- Detail of engine

Engine Displacement	98.2 CC
Engine Type	Air cooled, 2-stroke
Number Of Cylinders	1
Max Power	7.9 PS @5500 rpm
Max Torque	9.8 Nm @5000 rpm
Bore x Stroke	50.0 x 50.0 mm
Fuel Type	Petrol
Starter	Kick

Air intake & Exhaust pressure

- Air intake pressure into air cleaner & in engine = 0.4 bar (Normal Condition)
- Air intake pressure into air cleaner & in engine = 0.3 bar (Turbocharged Condition)
- For our analysis it is 0.3 bar
- Engine exhaust pressure = 5 bar or 500000.0 Pa
- Air inlet through Air filter = .35 Atm or 35000.0 Pa

Engine analysis

- Engine Ideal RPM: - 1500 RPM
- Maximum Engine RPM: - 12000 RPM
- Turbocharger RPM: - 20000 RPM
- Average Increased: - 5 Km*

(Under Specific Conditions)

Specific Conditions

- Engine RPM = 3000 RPM
- Turbocharger RPM = 18000 RPM
- Weight on Bike = 45 kgs
- Vehicle Speed = 40 Kmph
- Tested in Vacuum & Frictionless Surface.

IV. FABRICATION OF TURBOCHARGER

- First of all, we make a whole report of all the difficulties indicating the needs, aims or purposes.
- Select the finest material which is suitable for the engine.
- Take whole measurement with perfect dimension.

Figure 7. Fabricated Turbocharger_1

Figure 8. Fabricated Turbocharger_2

PROCEDURE INVOLVE

- We have attached the turbo inlet with engine exhaust port with the help of 0.8 mm plate section and studs.
- The turbine shaft is connected to a compressor, which draws in combustion air, compresses it and then transfer it to the engine.
- Now we connected air filter with turbo compressor section.
- After we connected turbo air inlet with hose pipe with carburettor.
- Now connect carburettor with engine.
- We connected silencer with waste gate from where the waste gas will flow.

Figure 9. Without turbocharged engine

V. PROBLEM SPECIFICATION

Turbo lag is a problem that is met by almost every turbocharger system installed on single cylinder engine. This is well-defined by the quantity of time it takes for the turbocharger to build adequate pressure in the combustion chamber of the vehicle before the full possible of the vehicle's performance is realized. Careful timing is necessary in single cylinder engine to avoid turbo lag at the wrong time. That means proper throttling is needed. It can send the vehicle out of control, mainly in tight corners where tire grip is already compromised.
It is the time compulsory to change power output in response to a throttle change, noticed as a reluctance or slowed throttle response when accelerating as compared to a naturally aspirated engine. This is due to the time needed for the exhaust system and turbocharger to produce the required boost. Inertia, friction, and compressor load are the main contributors to turbocharger lag.

VI. RESULT & CONCLUSION

2-stroke engines such as common gasoline-powered engines, create more exhaust emissions as compare with 4-stroke engines because their 2-stroke oil lubrication mixture is also burned in the engine, due to the engine's total loss oiling system. The Carbon monoxide Hydrocarbon and Nitrogen oxide at full acceleration conditions and (Air fuel) at idling conditions for some designated gasoline vehicles were also monitored to access the change in emission characteristics. Here is the emission test of 2-stroke engine with and without turbocharger and we found that CO & HC pollutant agent is reduced in turbocharged engine by comparing with non-turbocharged 2-stroke engine.

Table 2 : Emission Measurement of Suzuki Engine (Without Turbo- Charger)

Fuel	CO Reading		HC Reading	
	Regulation	Actual	Regulation	Actual
Petrol	3.5	1.940	4500	3860

Table 3: Emission Measurement of Suzuki Engine (With Turbo- Charger)

Fuel	CO Reading		HC Reading	
	Regulation	Actual	Regulation	Actual
Petrol	3.5	1.52	4500	2136

Advantages

- More power compared to the similar size naturally aspirated engine.
- Better thermal efficiency over naturally aspirated engine.
- Better Fuel Economy by the way of more power and torque from the same sized engine.
- Continual development of this technology has produced an engine that easily meets emissions and fuel economy standards.
- As compare with non-turbocharged engine we found better volumetric efficiency in turbocharged engine.
- A proper scavenging processes is done by using turbocharger.
- Decreased exhaust emission pollution.
- Eco-friendly

Disadvantages

- As compare to normal engine the engine cost will be increase.
- Engine weight will increase.
- If there will be unsuitable maintenance or not proper acceleration will be done then there will be problem in turbo such as turbo lag.

VII. Future Scope

For future scope we would be:

- Reducing the exhaust noise.
- Reducing the extra heat produced.
- Providing proper space for the turbocharger.

VIII. REFERENCES

[1]. Abhishek Saini, Prakash Shakti, Himanshu Kulshrestha, "Turbocharged Single Cylinder SI Engine" International Conference on Research in Science, Engineering & Management (IOCRSEM 2014)

[2]. Performance analysis on a turbocharged two wheeler engine (ISSN :2319-5991 VOL-2, NO. 4, P Balashanmugam1, E Elakiya1 and Sunayana Sharma1)

[3]. Performance Analysis and Fabrication on a Turbocharger in Two Stroke Single Cylinder Petrol Engine (IJETI Vol. 2 Issue 2, Mohammad Israr, Amit Tiwari, Mahendra Labana, Anshul Gangele)

[4]. Petitjean D, Bernardini L., Middlemass C. and Shahed S.M (2004).Advanced gasoline engine turbocharging technology for fuel economy improvements. SAE Technical Paper Series, 2004-01-0988

[5]. Wallance F J et al, "Thermally insulated diesel engine", Proc. Of the Institution of Mech. Engrs., vol 198A, No.: 5, PP 97-105.2000.

[6]. Gamas E D, Diaz L, Rodriguez R, Lopez- Salinas E and Schifter I (1999), "Exhaust emissions from gasoline and LPG-powered vehicles operating at the altitude of Mexico City", J. Air and Waste Management Assoc., Vol. 49, pp. 1179-1189.

[7]. Cadle S H, Mulawa P, Hunsanger E C, Nelson K, Ragazzi R A Barrett R, Gallagher G L, Lawson D R Knapp K T and Snow R (1999), "Light-Duty Motor Vehicle Exhaust Particulate Matter +Measurement in the Denver, Colorado, Area", J. Air & Waste Manage. Assoc., Vol. 49, pp. 164-174.

[8]. Graskow B R, Kittelson D B, Abdul-Khalek I S, Ahmadi M R and Morris J E (1998), "Characterization of exhausts particulate emissions from a spark ignition engine", Society of Automotive Engineers, paper No 980528.

[9]. Baines Nicholas (2005), Fundamentals of Turbo charging Concepts ETI, ISBN 933283- 14-8.