

## International Journal of Innovative Research in Science, Engineering and Technology

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# Performance Analysis of Single Cylinder 4 Stroke S.I. Engine Using Turbocharging System

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**ABSTRACT:** Now a day's whole world facing the problem of reducing the fuel. So there is need to reduce fuel consumption. In a conventional IC engine exhaust gases carry a considerable heat away. To recover the waste heat, various methods are being adopted. One of them is turbo charging. In this project an attempt has been made to explore the various chances of exhaust heat energy recovery methods in bike. The heat Energy carries in the exhaust gases are recovered in different methods. Thus the principle of electro turbo generation has been adopted for waste heat recovery In order to use the aforesaid combination of waste energy recovery systems a matrix has also been suggested. Due to the increase of bikes, petrol consumption and emission rate increases. It is also good with regard to economical considerations and engine efficiency.

**KEYWORDS:** Turbocharger, S.I. Engine, Fuel Consumption.

## I. INTRODUCTION

A turbocharger or turbo is a forced induction device used to allow more power to be produced for an engine of a given size. The key difference between a turbocharger and a conventional supercharger is that the latter is mechanically driven from the engine often from a belt connected to the crankshaft, whereas a turbocharger is driven by the engine's exhaust gas turbine. A turbocharged engine can be more powerful and efficient than a naturally aspirated engine because the turbine forces more intake air, proportionately more fuel, into the combustion chamber than if atmospheric pressure alone is used. Turbos are commonly used on truck, car, train and construction equipment engines. Turbos are popularly used with Otto cycle and diesel cycle internal combustion engines.

## II. TURBOCHARGING

The ultimate reason that we are interested in turbocharging system for increase efficiency and output power of SI. Engine. All we the concern about Turbocharging system because of following reasons. Today Need to reduce use of fuel all over world. Better Fuel Economy by the way of more power and torque from the same sized engine. A century of development and refinement for the last century the SI engine has been developed and used widely in automobiles. Continual development of this technology has produced an engine that easily meets emissions and fuel economy standards. With current computer controls and reformulated gasoline, today's engines are much more efficient and less polluting than those built 20 years ago.

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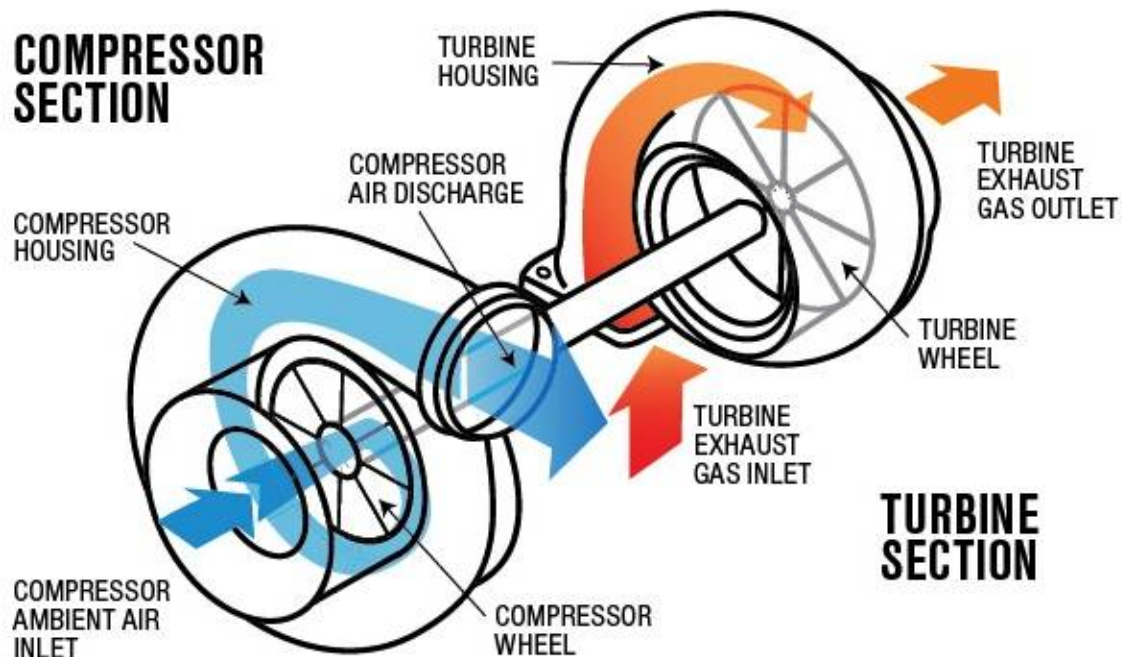


Fig.1 Turbocharger

### III.LITERATURE REVIEW

#### TURBOCHARGED SINGLE CYLINDER SI ENGINE

By: Abhishek Saini, Prakash Shakti, Himanshu Kulshrestha

To study on the effect of turbocharger on a single cylinder is made. The design and installation of turbocharger in a single cylinder is available in this project. They used HONDA STUNNER CBF 125cc for the installation of turbocharger. The turbines extracts wasted kinetic energy and thermal energy from the high temperature exhaust gas flow and produces the power to drive the compressor, at the curt of the slight increasing the pumping losses. They design and fabricated a prototype of a turbocharger was implemented in two wheeler. The aim of this project is to increase the efficiency of engine and at the same time to control the emission from the engine. They used ANSYS software to analysis component of turbocharger.

#### PERFORMANCE EVALUATION OF SINGLE CYLINDER FOUR STROKE S. I. ENGINE USING TURBOCHARGING SYSTEM

By: Prashant Jadhav, S.U Patel

In this project they used catalytic converter for control the emission. They analysed that the HC emission from two wheel vehicles from 2 to 4 times at the full acceleration engine condition. By using turbocharger its purpose is to increase the volumetric efficiency of the combustion chamber. They used mini turbocharger, 100cc bike TVS CENTRA of single cylinder 4 stroke S.I. engine. Aim of this project is to increase the average of vehicle and decreased the hazardous gases from exhaust and they achieved their goals by performing experiment.

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### PERFORMANCE ANALYSIS ON A TURBOCHARGED TWO WHEELER ENGINE

BY: P Balashanmugam, E Elakiya and Sunayana Sharma.

They analysed that the modern turbocharger is based on the principle that if air entering in an engine is pressurised more oxygen then adding more fuel in engine results in high torque and more power. In this project author used a SUZUKI engine 100cc for analysis. The additional oxygen makes it possible to add more fuel, increasing the power and torque output the engine by using turbocharger. The results show that the exhaust emission is reduced.

### FABRICATION OF TURBOCHARGER FOR TWO WHEELER

BY: Ahir Nischal a, Sofia alia, Darshan s shah, Sneh r prajapati

Turbocharger engine is more powerful than natural aspirated engine. The aimed of this project is to measured pressure and temperature of the exhaust of engine. Also comparison of engine performance with and without turbocharger. The results show that during full throating about found emitting HC not within the prescribed national standard of 2000 PPM.

### IV. LITERATURE GAP

As engine runs for long period on different road conditions its performance goes on decreases. This decreased in performance of an engine because of improper combustion inside the cylinder. So emission rate goes on increases. There will be a more amount of NO<sub>x</sub> and environmental harmful components will produce. Also engine gives low millage at high fuel consumption..

A few years ago our Indian government decided to ban the production of BS2 engine for 2 wheeler because of it produced more emission rate than BS3. But their arm ant two wheelers are running on road which have BS2 and BS1 engine which produced harmful emission component with more amounts. Government banned the production of BS2 and BS1 two wheeler but there is no any device developed which reduces emission rate of exiting BS2 and BS engine and increases its performance. If turbocharger is fitted with that engine system we can achieved that goals.

In recent month rate of petrol goes on increasing day by day. It is not economically profitable for common people. India is country of common man, that common man use two wheeler. The users of two wheeler are more than four wheeler. So it required to increase the millage of an engine. If we apply turbocharging system along with engine then we get increase in millage approximately up to 8km/lit. Now days there is no any turbocharged two wheeler available in market which profitable to commonman.

### V. EFFECT OF TURBOCHARGING

- Higher power output.
- Better scavenging of output.
- Greater induction charge.
- Better automation of fuel.
- Better mixing of air and fuel.
- Quicker acceleration of vehicle.
- More complete and smoother combustion.
- Better torque and characteristics over the whole speed range.
- Better interior and poor ignition quality fuel usage.
- Increase detonation tendency in S.I. engine.
- Improved cold starting.
- Reduced exhaust stroke.
- Reduced specific fuel consumption.

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- Increase thermal efficiency.
- Increase heat loss.
- Increase gas loading.
- Increase valve overlap period of crank angle.
- Increase cooling requirements of piston and valve.

## VI. WORKING PRINCIPLE

A turbocharger consists of a turbine and a compressor on a shared shaft. The turbine converts heat to rotational force, which is in turn used to drive the compressor. The compressor draws in ambient air and pumps it in to the intake manifold at increased pressure, resulting in a greater mass of air entering the cylinders on each intake stroke. The output of the engine exhaust gas is given to the input of the turbine blades, so that the pressurized air produced. This power, the alternate power must be much more convenient in availability and usage. The next important reason for the search of effective, unadulterated power are to save the surrounding environments including men, machine and material of both the existing and the next fourth generation from pollution, the cause for many harmful happenings and to reach the saturation point. We have designed and fabricated a prototype of the Turbocharger was implemented in Two-wheeler, in which the efficiency of the Engine can be increased. Thus we have developed a method to increase the efficiency of the engine and at the same time to control the Emissions from the engine. The experimental setup of block diagram shows the arrangement of turbocharger in two- wheeler. This type of engine will be more efficient than existing engine.

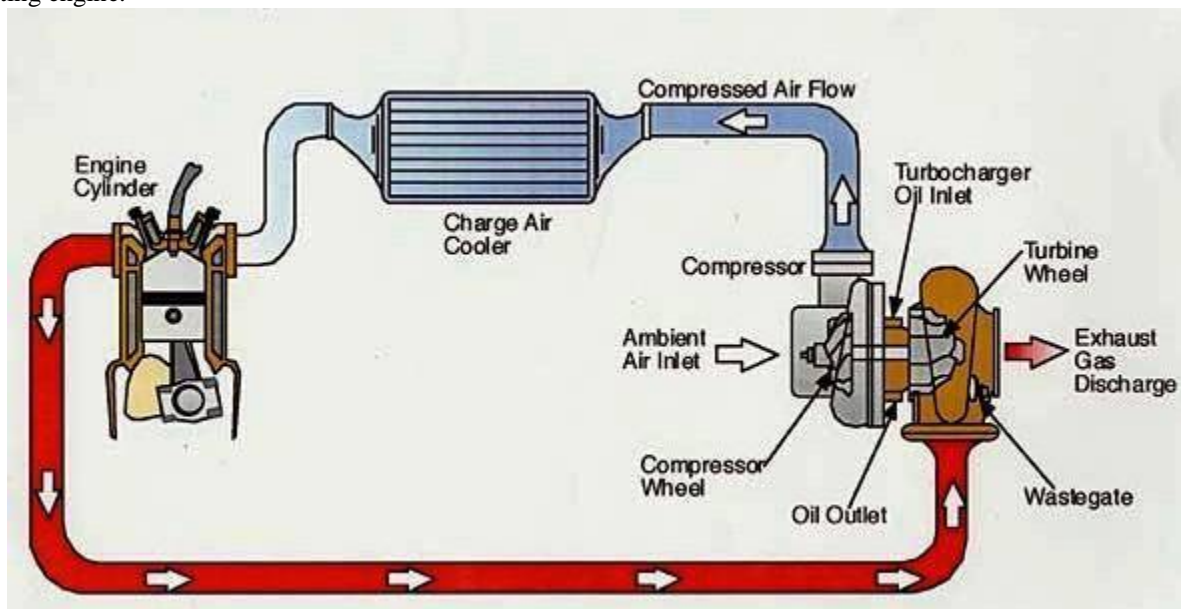


Fig.2 Working of Turbocharger

## VII. PART USED

- Engine (90cc to 150cc)
- Turbocharger
- Silencer

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- Filter
- Intercooler
- Carburettor

### VIII. LAYOUT DIAGRAM OF TURBOCHARGER FOR TWO WHEELER

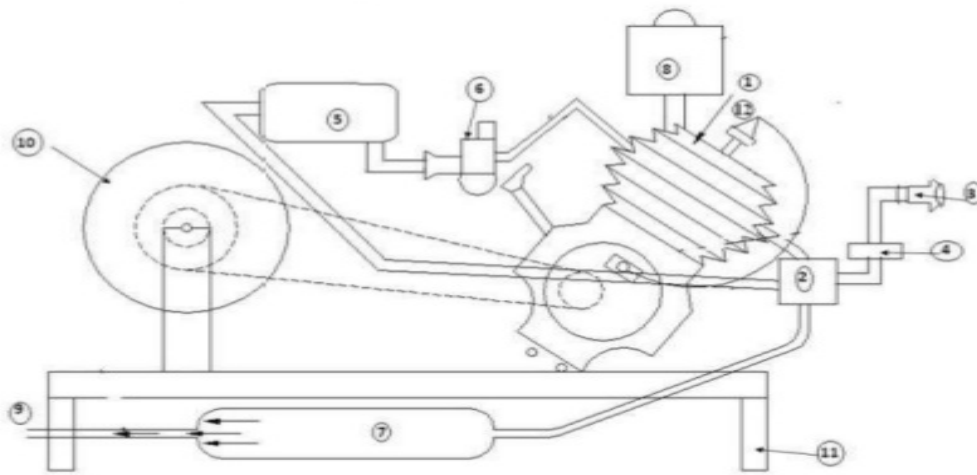


Fig.3 layout of turbocharger engine

This is layout diagram of turbocharging fitting in S.I engine. From this diagram we clearly understand of each part. The numbering wise part names are given below.

1. Engine
2. Turbocharger
3. Air Inlet
4. External Air Filter
5. Internal Filter
6. Carburetor
7. Exhaust Pipe
8. Fuel Tank
9. Exhaust Gas
10. Wheel
11. Base
12. Spark Plug

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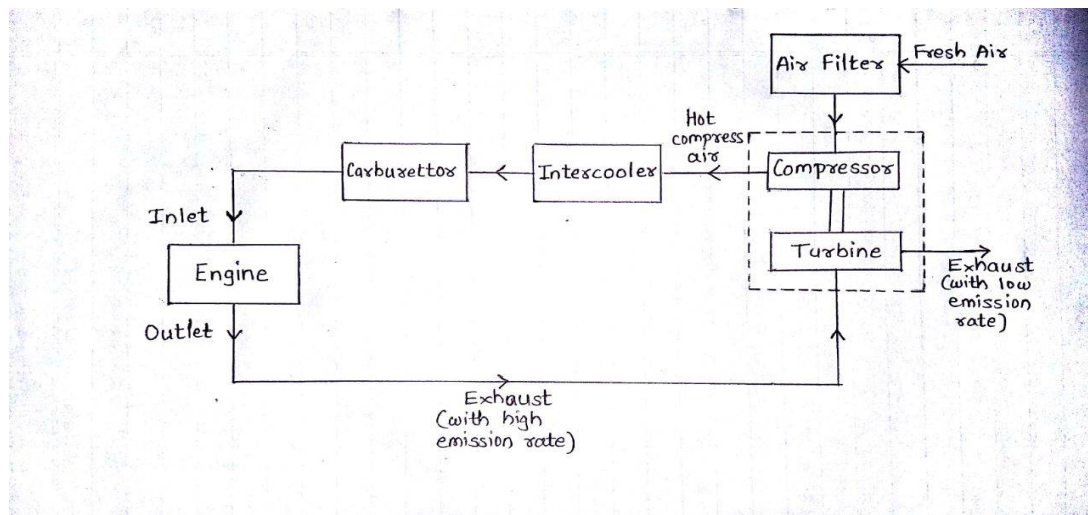


Fig.4 block diagram of turbocharged engine

Above block diagram helps to understand circulation of exhaust gas throughout the cycle. From that we also understand the inlet of fresh air and outlet of exhaust gas.

### IX. CONCLUSION

A lot of research, work & study have been done by many researchers in the field of bike exhaust system for improve performance and efficiency and it help to control emission of exhaust system with added mini catalytic convertor on exhaust system of S. I. Engine. Thus turbocharging is a method to increase the efficiency of the SI Engine and at the same time to control the Emissions from the engine. The significance of turbocharger in power generation, fuel economy and emission. A turbocharged engine will have more break thermal efficiency than existing engines. This work is an attempt to minimize our dependency on foreign oil and reduce the tail pipe emission from automobiles. Here we review of Turbocharger implemented in two wheeler, in which the efficiency of the Engine can be increased. Thus we have developed a method to increase the efficiency of the SI engine and at the same time to control the Emissions from the engine exhaust. This type of engine will be more efficient than others. It is also good with regard to economic considerations and engine volumetric efficiency. This work is an attempt to reduce the tailpipe emission from automobiles and increase the average of bike this was an attempt to design and implement this new technology that will drive us into the future. Use of production turbo charger will reduce smog forming pollutants.

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