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A Review - Performance Evaluation of Single Cylinder Four-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 possibilities of waste heat energy recovery methods in conventional commercial two wheeler and four wheelers. In this context, a new concept of hybrid engine has also been discussed. The heat Energy carries in the exhaust gases are recovered in different methodologies. Firstly, by introducing an auxiliary combustion chamber and injecting an additional suitable fuel and then allowing it to expand in a turbine, which forms the part of turbo charger unit.

The waste heat energy is used to burn an additional amount of fuel. The second stage contains a thermoelectric generator, which produces electrical energy by utilizing the high heat of exhaust gases. The third stage energy recovery is done by coupling a compressor and an alternator. Both being coupled to the turbine shaft, produces electrical energy and compressed air which can be accumulated and used effectively for running any auto auxiliaries. 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.

Keywords : Turbocharger , S. I. Engine, Exhaust System

I. INTRODUCTION

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. Turbo are commonly used on truck, car, train and construction equipment engines. Turbo are popularly used with Otto cycle and Diesel cycle internal combustion engines.

The engine exhaust gas is given to the input of the turbine blades, so that the pressurized air generated. This power, the 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.

The most power against the natural resource is supposed to be the electric energy and solar energies that best suit the vehicles. The unadulterated zero emission electrical and solar power, is the only easily attainable alternate source. What the turbo - charged was does is that it simply Increases the volumetric efficiency of the engine.

In turbo charging, the turbocharger is being driven by a gas turbine using the energy in exhaust gases. The major parts of turbocharger are turbine wheel, turbine housing, turbo shaft, wheel, housing & bearing housing. A 4-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 using spark plug, it is achieved by installation of spark plug on

cylinder head. In this project I am using 100cc Bike for the installation of turbocharger.

II. METHODS AND MATERIAL

1. Objective

A Turbo-Hybrid Motorcycle consists of a 100cc Engine Bike And On Exhaust of bike mount Turbocharger after the air charge in compressor by turbocharger give to intake manifold, before intake manifold use Air Filter For instance the air filters in your bike; their basic function is to prevent dust from entering the engine, which could cause serious damage to the performance of the bike. And if your bike is fitted with paper filter then change it regularly according to the instructions given by the manufacturer .Oil line & Oil Pump We are using oil line for good & smooth working of turbocharger. In this case we are using 10W40 mineral-based oil. The oil use for the lubricant as well as cooling purpose. Oil pump is used to supply of oil into the turbocharger and last component is Battery is use to supply of current into the oil line & in oil pump. We are using Mini turbine housing, Internal casing Shaft, turbine, rubber hoses, hot gas pipe are the main component.

2. Turbocharger

It has been always a challenge to drive turbocharger with exhaust gases in single cylinder two strokes S.I. Engine but it possible by changing the design of exhaust pipe and attach turbocharger to exhaust gases. But in conventional IC engine use Supercharger to The most efficient method of increasing the power of an engine is by supercharging, i.e. increasing the flow of air into the engine to enable more fuel to be burnt the drawback is to use Supercharger is run by the mechanical drive, powered by engine power. Means some amount of power consume from engine to drive supercharger. But A turbocharger uses the otherwise unused energy in the exhaust gases to drive a turbine directly connected by a co-axial shaft to a rotary compressor in the air intake system A turbocharger in Figure 1. Is a device fitted to internal combustion engines to increase power. In a normal engine the amount of power the engine produces depends on how much fuel is burnt in the cylinders. In a engine without turbocharger a mixture of air and fuel is drawn into the engine as the piston moves down in the cylinder. The ideal mixture is 14.7:1 air to fuel for gasoline. This is called the stoichometric ratio. If you always try to maintain this ratio then if you add more air to an engine you must add more fuel. And if you are burning more fuel you will generate more power. The turbocharger is simply a device to force more air into the engine.

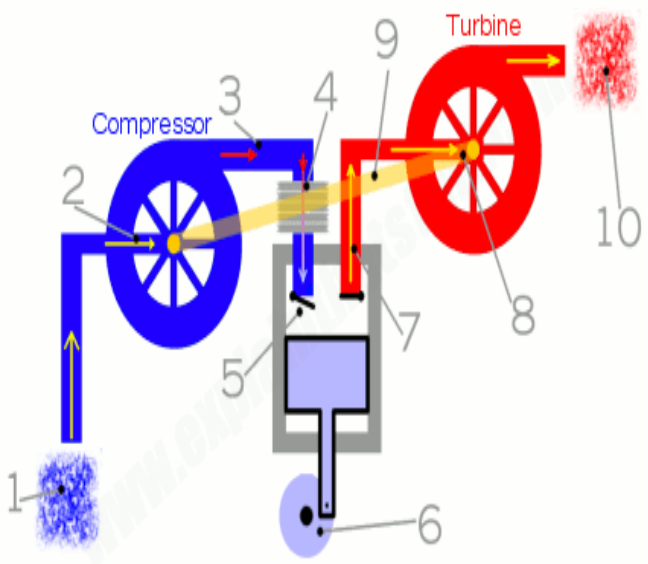

Figure 1. Turbocharger working of use of exhausts gases.

1. Fresh air enters in the engine air intake and heads toward the compressor.
2. The compressor fan helps to suck air in.
3. The compressor incoming air and blows it out again.
4. Compressed air from the compressor passes to the heat exchanger, air cools down.
5. Cooled, compressed air enters the cylinder's air intake. The extra oxygen helps to burn fuel in the cylinder at a faster rate.
6. The cylinder burns more fuel, it produces energy and send more power to the wheels via the piston, shafts, and gears.
7. Waste gas from the cylinder exits through the exhaust outlet.
8. The hot exhaust gases past the turbine fan rotate at high speed.
9. The spinning turbine is mounted on the same shaft as the compressor So as the turbine spins, the compressor spins too.
10. The exhaust gas leaves the car, wasting less energy than it would otherwise.

To increase the amount of air in the engine the turbocharger uses a compressor. The compressor consists of a finned wheel that spins at high speed in a

specially shaped housing called a volute. Air is drawn into the center of the compressor wheel and accelerated as it is flung to the outside of the wheel. The volute channels and slows the air which causes its pressure to increase. Increasing the pressure means you can now have more air in a given space, such as the space inside a cylinder. The amount by which the air is compressed is called 'boost'.

The compressor wheel must run at very high speeds to give useful levels of boost. The compressor wheel is connected to one end of a shaft which runs through the central core of the turbocharger.
The shaft usually runs in plain bearings which need constant lubrication. Oil under pressure must be pumped through the central core constantly. When it is turning the shaft is essentially 'floating' on a cushion of oil. The oil also helps remove heat generated by friction. Without proper lubrication a turbocharger will very quickly fail. The core of the turbocharger may also contain passages through which cooling water is circulated.

At the opposite side of the shaft from the compressor to the turbine wheel. The turbine wheel is also contained in volute housing but in this case hot exhaust gases from the engine are fed in from the edge of the housing and flow out from the centre of the wheel. The flow of hot gas causes the wheel to accelerate to the very high speeds the compressor needs to provide a lot of boost. The gases passed to the turbine wheel it flow through the normal exhaust system of the engine. Because boost can actually be damaging to an engine a way of limiting the turbine wheel speed is needed. One way of doing this is with a waste gate. The waste gate allows the hot exhaust gases to bypass the turbine wheel. Instead of driving the turbine the gases simply flow through an alternate passage in the turbocharger directly into the exhaust system.

3. Turbocharger Working Principal

A turbocharger is a radial fan pump driven by the energy of the exhaust gases of an engine. A turbocharger consists of a turbine and a compressor on a shared shaft. The turbine converts exhaust 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.

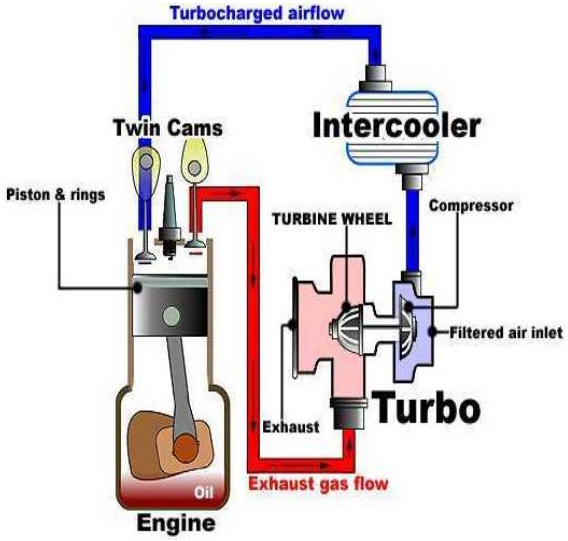

Figure 2. Turbocharger working

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 outlet of the engine exhaust gas is given to the inlet of the turbine blades, so that the pressurized compress air produced. This power, the alternate power must be 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.

III. 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 we have developed a method to increase the efficiency of the S.I. engine and at the same time to control the Emissions from the engine. The various plots drawn from the results of load test show 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.

IV. REFERENCES

[1] P Balashanmugam, E Elakiya, "Performance Analysis On a Turbocharged Two Wheeler Engine" in IJERST, ISSN 2319-5991 www.ijerst.com,vol. 2, no. 4, november 2013.

[2] Mohd Muqeem, "Turbocharging With Air Conditioner Assisted Intercooler", IOSR Journal of Mechanical and Civil Engineering, ISSN: 2278-1684 Vol. 2, Issue 3, pp. 38-44, 2012.

[3] A .Kusztelan, Y.F. Yao, D.R. Marchant, Y. Wang, "A Review of Novel Turbocharger Concepts for Enhancements in Energy Efficiency", International Journal of Thermal & Environmental Engineering, Vol. 2, No.2, pp.75-82, 2011.Automobile Engineering by Dr.Kirpal Singh.

[4] Pathak Sunil, "Turbocharging and Oil Techniques in Light Motor Vehicles", Research Journal of Recent Sciences, Vol. 1, pp. 60-65, 2012.Hgj

[5] S. Shaaban and J. Seume, "Impact of Turbocharger Non-Adiabatic Operation on Engine Volumetric Efficiency and Turbo Lag", International Journal of Rotating Machinery, Vol. 2012, Article ID 625453, 11 pages, 2012.

[6] Yashvir Singh, Nishant Kr. Singh, Rakesh Prasad and Hemant Kr. Nayak, "Performance Analysis of Supercharging of Two Wheelers" International Journal of Mechanical Engineering and Technology, ISSN 0976 – 6359 Vol. 2, Issue 2, pp. 63-69, 2011.

[7] Automobile Engineering by Dr.Kirpal Singh

[8] CBT, Mercedes-Benz.