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EXPERIMENTATION OF PERFORMANCE AND EMISSION TEST IN SINGLE CYLINDER SI ENGINE WITH TURBOCHARGER AND EGR

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Abstract - The progress of automobiles for transportation has been intimately associated with the progress of civilization. The automobile of today is the result of the accumulation of many years of pioneering research and development. An attempt has been made in this project; the exhaust gas is used to rotate the turbine with blower arrangement. Exhaust gas is used to rotate the blower and this air is given to the ignition input supply. Our foremost aim of selecting this project is to use efficiency turbo charging and EGR. It is also good with regard to economic considerations and engine efficiency. In vehicle low speed condition, one small compressor is used to supply the air to the carburetor. The control unit used to detect the vehicle speed and this is activating the compressor at low speed condition only. In order to satisfy today‟s requirements for better efficiency, CO2 and noise emissions - turbo charging can achieve all those goals. During the turbo charging and exhaust gas recirculation a big part of the usually lost exhaust energy is being used to drive the turbocharger and EGR. The turbine wheel inside the turbocharger is driven by this exhaust energy passed through the EGR box which will then power a shaft connected to a compressor wheel. The compressor wheel compresses the air intake for the engine.. The control unit used to detect the vehicle speed and this is activate the compressor at low speed condition only.

Key Words: noise emissions, turbocharger, EGR

1. INTRODUCTION

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. The most talented power against the natural resource is supposed to be the electric and solar energies that best suit the automobiles. The unadulterated zero emission electrical and solar power, is the only easily attainable alternate source. Hence we decided to incorporate the solar power in the field of automobile, the concept of many Multinational Companies (MNC) and to get relieved from the incorrigible air pollution. Turbocharging is usually carried out in diesel engines. This is because turbochargers work using the pressure from the exhaust gas (For diesel engines the compression ratio is high and hence the pressure.). But it can be used in petrol engines also if the engine is 4 cylinders or more. Turbo charging a bike is possible only if it is a 4 cylinder one. Usually only performance bikes are turbocharged. It is also possible to improve the performance of a bike using Nitro injection; bigger carburetors, etc, but the advantage of turbo charging its stock engine is that you save a lot of money and at the same time obtain better performance. Modern turbocharger is based on the principle that if air entering in an engine is pressurized more oxygen and then adding more fuel in the engine result in higher torque and more power. A turbocharged engine produces more power overall than the same engine without the charging. This can significantly improve the power to weight ratio for the engine. Now a day's turbocharger is used in heavy vehicle, racing cars and racing bikes. The Supercharger – or, as the Germans call it, Compressor! It's a common tendency, especially amongst enthusiasts, to look for ways in which to quench the thirst to produce ever more power from the engine of their cars. Well, maybe not so much in our country –But certainly in more affluent countries, where enthusiasts have the financial capability, and desire, to soup up their cars in the search for better performance.

1.1 PROBLEM IDENTIFICATION

Automobile pollution is the major source of pollution. It caused many diseases for human beings. A normal bike has its own power and its emission value, But by implementing the turbocharger and EGR we can normalize the emission and increase the power of engine

1.2 Literature collection

Watson and Janota, Turbocharging is nothing but to increase the air density by increasing its pressure before it enters the cylinder. Turbocharging is kind of supercharging but beneficial than supercharging due to turbo charger uses use nearly wasted energy from exhaust gases to run rotary compressor and it compresses the inlet air going to inlet manifold at the same time supercharger used for same reason but it runs on the power from the crankshaft. Turbocharger consists of radial compressor and radial turbine on the same shaft on the same shaft.

Heywood, John, B: Most of the IC engines are running by utilizing the air-fuel mixture, due to these emissions from the engines is releasing more unwanted and UN combusted gases. It will restrict by sending the pure oxygen into the engine cylinder. The oxygen content in the air is varied 21% to 27% by using this amount of oxygen the combustion is going to take place whereas remaining gases exhaust from the engine at high temperatures and these are polluting the environment by mixing with air.

Azzoni.P, Moro. D, Ponti, F & Rizzoni: G, Due to this CO2 content in the air, increasing periodically. The emissions exhausted from the engines are reduced by restricting the presence of unwanted gases into the engine cylinder. It determines the pure oxygen in the combustion chamber will affects the complete combustion by utilizing along with gasoline. By using pure oxygen in combustion chamber power and torque of the engines are hikes; it is done by increasing the amount of oxygen into the engine cylinder. This causes the emissions exhausted from the combustion chamber are reduced due to absence of remaining gases at the time of combustion. Also the complete combustion will take place in engine cylinder.

RANJEETH RANA: We all know that one of the prime objectives of any innovation is to achieve maximum output with minimum input. Automobiles also have innovations that aim at achieving maximum mechanical efficiency & fuel-economy, both simultaneously. The following project-paper focuses on one of the most important topics Turbo charging in S.I engines.

Konstantinos Siokos: Low-displacement turbocharged spark-ignition engines have become the dominant choice of auto makers in the effort to meet the increasingly stringent emission regulations and fuel efficiency targets. Low-Pressure cooled Exhaust Gas Recirculation introduces important efficiency benefits and complements the shortcomings of highly boosted engines. The main drawback of these configurations is the long air-path which may cause over-dilution limitations during transient operation. The pulsating exhaust environment and the low available pressure differential to drive the recirculation impose additional challenges with respect to feed-forward EGR estimation accuracy.

Abhishek Saini: 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, comp. wheel, comp. housing & bearing housing.

2. METHODOLOGY

Basically it consists of inducing the molten metal into a cavity of mould of the required form and allowing the metal to solidify. The object after solidification removed from the mould. In forming process metal may be heated to temperature which is slightly below. This solidify temperature and large force is applied such the material flows and act in desired shape. These are secondary manufacturing processes where the starting raw materials are produced by any one of the previous manufacturing processes desired. Its assembly involve joining pieces either temporary or permanent. Welding is a process of joining two metal pieces by the application of heat. Welding is the least expensive process and widely used now a days in fabrication. Welding joints different metals with the help of a number of processes in which heat is supplied either electrically or by mean of a gas torch

3. COMPONENTS USED

Table -1: components

SL.NO.	COMPONENTS
1	Bike
2	Turbocharger
3	Impeller
4	EGR

BIKE:

TVS Star city bike is selected for the project. The TVS star city is powered by a 109.7 cc air-cooled engine which produces 8.4 PS of power @7000 rpm. It produces a maximum torque of 8.7 nm @5000rpm. It has a single cylinder four stroke engine. It has a fuel tank of 10L and a claimed mileage of86 kmpl. The engine has a bore of 53 mm and stroke if 48 mm. It has a chain type transmission and a 4 speed gearbox. It has a wet multiplate clutch.

SELECTED BIKE

TURBOCHARGER:

A turbocharger or a turbo is a turbine-driven forced induction device that increases an internal combustion engine's efficiency and power output by forcing extra compressed air into the combustion chamber. This improvement over a naturally aspirated engine's power

output is due to the fact that the compressor can force more air and proportionately more fuel into the combustion chamber than atmospheric pressure alone. A turbine with 29 fins is used in the turbocharger.

TURBOCHARGER

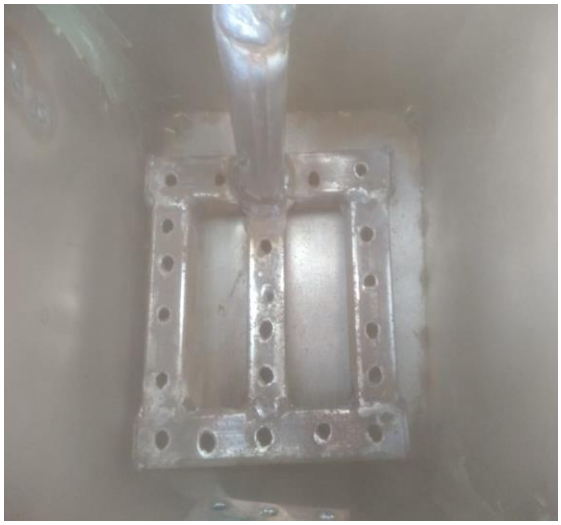
IMPELLER:

An impeller is a rotor used to increase the pressure and flow of air. The main part of a turbocharger is the impeller which is used to compress the air. A Impeller with 29 fins is used to compress the fresh charge of air that is supplied to the carburetor.

IMPELLER

EGR:

EGR also known as Exhaust Gas Recirculation is a nitrogen oxide emissions reduction technique used in petrol/gasoline and diesel engines. EGR works by recirculating a portion of an engine's exhaust gas back to the engine cylinders. This dilutes the O2 in the incoming air streamand provides gases inert to combustion to act as absorbants of combustion heat to reduce peak in-cylinder temperatures.



EGR

The gear is the member which engages with the rack that is bent and welded to the outer rim. The gear member is ten attached to the chain drive with a rod placed between them.

CARBON FILTER:

Carbon filtering is a method of filtering that uses a bed of activated carbon to remove contaminants and impurities, using chemical absorption. Each particle/granule of carbon provides a large surface area/pore structure, allowing contaminants the maximum possible exposure to the active sites within the filter media. One pound (450 g) of activated carbon contains a surface area of approximately 100 acres (40 Hectares).Activated carbon works via a process called adsorption, whereby pollutant molecules in the fluid to be treated are trapped inside the pore structure of the carbon substrate. Carbon filtering is commonly used for water purification, in air purifiers and industrial gas processing, for example the removal of Sloane and hydrogen sulfide from biogas.

ASSEMBLED BIKE

IV. CONCLUSION

Our project decreases the pollution level from the exhaust emissions and also increases the performance of the bike. After implementation of Turbocharger and EGR in single cylinder petrol engine of Two- wheeler, the BHP of the Engine increases & BSFC increases at a certain loading conditions, but at high load BSFC decreases and RPM Increases as compared without turbocharger. The emission of harmful exhaust gases will be in control while it passes through turbocharger.

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