Review On Kinetic Charger For Single Cylinder SI Engine

[1]Ketan V. Gunjal, [2]Sumit V. Savarkar, [3]Hemant D. Jawalkar, [4]Ramesh A. Dongre
Mechanical Department,
Savitribai phule Pune University, Ahemadnagar, Maharastra,India

***Abstract*-Now days with the use of technology of turbochargers (kinetic chargers) are used in two wheelers with increased volumetric and power efficiency compared to earlier era of automobile development. The progress of vehicles for transport has been intimately associated with the progress of peoples . The automobile of today is the result of the sum of many years of pioneering development and research. An attempt has been made in this project that fresh air is used to rotate the compressor with fan arrangement at front of vehicle. Here the measured the Vehicle Exhaust emission [Hydro carbon (HC) ,(Carbon monoxide (CO), Oxides of Nitrogen (NOX),Carbon dioxide (CO_2) of engine (100 cc) using Exhaust Gas analyzer for gasoline powered vehicles. The real time values were compared with standard ones, and the level qualified.**

***Keyword* - Kinetic charger, Exhaust, Emission, Automobile development, engine.**

I.INTRODUCTION

1.1 Concept of supercharging

Engine power is proportional to the amount of air and fuel that can get into the cylinders. All things being equal, larger engines flow more air and as such will produce more power. If we want our small engine to perform like a big engine, or simply make our bigger engine produce more power, our ultimate objective is to draw more air into the cylinder. The purpose of supercharging is to increase the mass of air trapped in the cylinders of the engine, by raising air density. This allows more fuel to be burnt, increasing the power output of the engine, for a given swept volume of the cylinders. Thus the power-weight and volume ratios of the engine increase. Since more fuel is burnt to achieve the power increase, the efficiency of the engine cycle remains unchanged. A compressor is used to achieve the increase in air density. Two methods of supercharging can be distinguished by the method used to drive the compressor. If the compressor is driven from the crankshaft of the engine or it can be driven by natural air drag, the system is called 'mechanically driven supercharging' or often just 'supercharging'. If the compressor is driven by a turbine, which itself is driven by the exhaust gas from the cylinders, the system is called 'turbocharging'.

There are two ways of increasing the power of an engine. One of them would be to make the fuel-air mixture richer by adding more fuel. This will increase the power but at the cost of fuel efficiency and increase in pollution levels prohibitive. The other would be to somehow increase the volume of air entering into the cylinder and increasing the fuel intake proportionately, increasing power and fuel efficiency without hurting the environment or efficiency. This is exactly what superchargers do; that increasing the volumetric efficiency of an engine. In a naturally aspirated engine, without a supercharger, the downward piston movement during the intake stroke creates the vacuum in the intake manifold which is used to draw the air-fuel mixture through the carburetor into the cylinder. With supercharging, however, due to high pressure the density of charge increases and, therefore, its weight per stroke is increased for the same swept volume.

The ability to fill the cylinder with air is its volumetric efficiency. Now if we can increase the pressure difference across the intake valves by some way we can make more air enter into the cylinder and hence increasing the volumetric efficiency of the engine. A supercharger does exactly this, it increases the pressure at the point where air is entering the cylinder, thereby increasing the pressure difference across the intake valves and thus more air enters into the combustion chamber. The additional air makes it possible to add more fuel, increasing the power and torque output of the engine, particularly at higher engine speeds. It is seen

that power output of engine is almost directly proportional to the weight of charge per minute, therefore the supercharged engines gives more output.

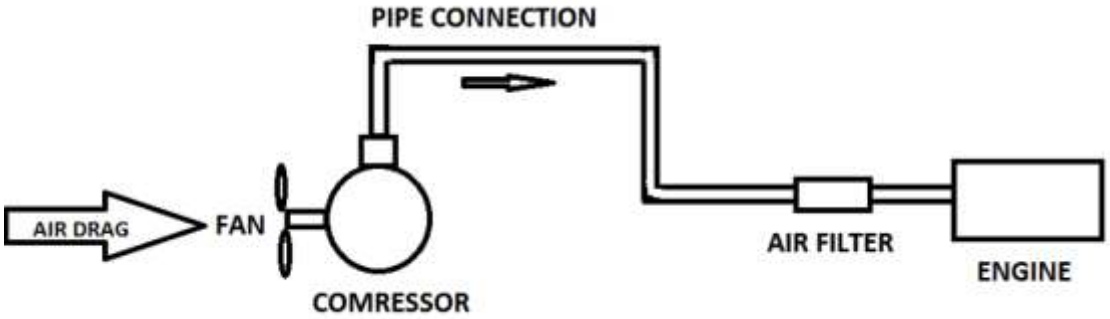

Fig.1.1 – Block Diagram of Supercharger unit

The supercharger is used to improve the efficiency and reduce the amount of exhaust gases by supplying the pressurized air in the combustion chamber. The air is pressurized by the compressor called as supercharging.

1.2 Concept of turbocharging

A turbocharger consists of a compressor and a turbine linked by a shared axle so if the turbine rotates, the compressor also rotates. The turbine inlet receives exhaust gases from the engine causing it to rotate. This rotation in turn drives the compressor, which compresses the ambient air and delivers it to the intake manifold of an engine at higher pressure, resulting in greater amount of air entering the cylinder. Now to some basics before we go ahead. There are two ways of increasing the power of an engine. One of them would be to make the fuel-air mixture richer by adding more fuel. This will increase the power but at the cost of fuel efficiency and increase in pollution levels prohibitive. The other would be to somehow increase the volume of air entering into the cylinder and increasing the fuel intake proportionately, increasing power and fuel efficiency without hurting the environment or efficiency. This is exactly what Turbochargers do; increasing the volumetric efficiency of an engine in a naturally aspirated engine, the downward stroke of the piston creates an area of low pressure in order to draw more air into the cylinder through the intake valves. Now because of the pressure in the cylinder cannot go below 0 (zero) psi (vacuum) and relatively constant atmospheric pressure (about 15 psi) there will be a limit to the pressure difference across the intake valves and hence the amount of air entering the combustion chamber or the cylinder. The ability to fill the cylinder with air is its volumetric efficiency. Now if we can increase the pressure difference across the intake valves by some way we can make more air enter into the cylinder and hence increasing the volumetric efficiency of the engine. A turbocharger does exactly this, it increases the pressure at the point where air is entering the cylinder, thereby increasing the pressure difference across the intake valves and thus more air enters into the combustion chamber. The additional air makes it possible to add more fuel, increasing the power and torque output of the engine, particularly at higher engine speeds. If the pressure in the cylinder goes too high it will cause the fuel to pre-ignite (remember more pressure = more temperature) in turn causing serious physical damage to the engine. To regulate pressure or boost, a waste gate is used. A waste gate controls the boost by routing some of the exhaust flow away from the exhaust side turbine. This controls the speed at which the axle rotates and in turn regulates the boost pressure by the compressor at the other

end. The application of a compressor to increase pressure at the point of air intake is also commonly referred to as forced induction. The turbocharger application in an engine also introduce 'Lag' which is a symptomatic of the time taken by the exhaust system driving the turbine to come to high pressure and for the turbine rotor to overcome its rotational inertia and reach the speed necessary to supply boost pressure. That is why in turbocharged cars, you feel the turbo kicking in after certain rpm is reached, at which point the exhaust system overcomes the rotational inertia of the turbine and speed it up to supply boost pressure.

II.LITERATURE SURVEY

S. Vanangamudi et.al. (2014)[1] Explained 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, which in turn to rotate the impeller connected it. Our fore most aim in selecting this project is to use efficiency turbo charging. It is also good with regard to economical considerations and engine efficiency

Himanshu Kulshrestha et.al.(2014)[2] Explained a 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 literature. 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 .Keywords: Gasoline Engine, Exhaust Manifold, Intake Manifold, Turbocharger, Nozzle, Flanges, K & N Air Filter, Carburetor, Turbine, Compressor. Volumetric Efficiency of a S.I. or C.I. Engine is increased by providing combustion chamber with maximum amount of air. This is achieved by installation of Turbocharger or Supercharger. Supercharger uses engine power to run itself whereas a Turbocharger doesn't utilize any engine power it runs by Exhaust gases. In present work we'll be increasing the volumetric efficiency of a 125cc single cylinder bike by installation of turbocharger.

Pasala Venkata Satish et.al (2015)[3] Stated that the recent developments in motorcycle engines a huge power gives an element of fun for riding and hence the demand for the faster bikes increased but in order to make it available for an economical price is the challenge so installing a supercharger is the best suggestion. However there are so many problems that had to be further resolved with respect to the application of the supercharger. The most important parameter of the engine is the size and shape because the twin cylinder v shaped engines have a great attractive look, if that was changed because of installing a supercharger it may degrade the look of the automobile. So the main objective of this project is to increase the torque and power of the two wheeler by supercharging the SI engine. For this purpose Bajaj discover 125 cc is analyzed for the work and certain parameters like torque, power, and specific fuel consumption vs rpm are calculated. This calculated data is used in software Engine Analyzer for analysis purpose together with the data of supercharger. It can be seen that power and torque of the engine increases from 7 to 11 KW and 9 to 13 NM at 7500 and 9000 RPM respectively.

Kaushik Kannan et.al. (2015)[4] Explained the effects of boost pressure on combustion and performance of an early injection homogenous charge compression ignition (HCCI) engine. A 2.0 liter, four-cylinder, four-stroke, direct injection, engine was converted to operate in early direct injection HCCI mode. In addition, a supercharger unit was developed for engine boosting. The experiments were performed for seven different intake pressures from 1.0 to 1.6 bar at different engine loads using n-heptane fuel, while maintaining constant engine speed, intake temperature, injection timing and injection pressure conditions. The effects of boost pressure were investigated on HCCI combustion and engine performance characteristics using measured in-cylinder pressure, heat release rate, combustion efficiency, indicated mean effective pressure (IMEP), thermal efficiency, and brake specific fuel consumption. The experimental results showed an increase in indicated thermal efficiency as boost pressure increased. In addition, combustion phasing advanced by increasing boost

pressure or decreasing lambda values. Combustions with CA505-8 °CA degree a TDC show the highest thermal efficiency especially at low boost pressure conditions. The test results also showed that HCCI operating range can be extended with the increase of intake pressure especially at high load limits.

Raghuram Pradhan et.al. (2015)[5] stated in Internal Combustion Engines burn fuel to create kinetic energy. The burning of fuel is basically the reaction of fuel with oxygen in the air. The amount of oxygen present in the cylinder is the limiting factor for the amount of fuel that can be burnt. The air to fuel ratio is the property of fuel and chemical composition of the fuel that defines the value for this ratio. Most of the fuels we use in internal combustion engines are hydrocarbons, and their burning will obviously result in the release of hydrogen and carbon as residuals, along with heat and pressure. The method is developed from a well established empirical model for the dependence of laminar flame speed on temperature, pressure and air-fuel ratio and relates this model to the heat release rate during the rapid burn phase, which is obtained from the cylinder pressure, based net heat release profile. The net heat release profile is computed from the cylinder pressure trace and quantifies the conversion of chemical energy of the reactants in the charge into thermal energy. The net heat release profile does not take heat- or mass transfer into account.

III. ADVANTAGES

- Exhaust gas is not required
- No requirement of engine power
- More reliable
- Is subjected to less Thermal and Mechanical stress
- Improve the performance of engine

IV.EXPECTED OUTCOME

We have designed and fabricated a prototype of the kinetic charger which will be 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 is shows the arrangement of kinetic charger in two-wheeler. This type of engine will be more efficient than existing engines.

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