Design And Development Of Kinetic Charger For Single Cylinder S.I. Engine

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Abstract: Now days with the use of technology of turbochargers (kinetic chargers) are used in two wheelers with increased power and volumetric efficiency compared to earlier era of automobile development. The progress of vehicles for transportation has been intimately associated with the progress of civilization. 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; the fresh air is used to rotate the compressor with fan arrangement at front of vehicle. Give the extra air to engine. Here the authors measured the Vehicle Exhaust emission [Hydro carbon (HC) ,(Carbon monoxide (CO), Oxides of Nitrogen (NOX),Carbon dioxide (CO2)] of Honda engine (100 cc) using Exhaust Gas analyzer for gasoline powered vehicles. The real time values were compared with standard ones, and the level qualified.

Keywords- Kinetic charger, Exhaust, Emission, Automobile development, Engine, etc.

1. INTRODUCTION

Supercharger-
Super charging is the process of supplying air fuel mixture at pressure above the atmospheric to the engine. On an ordinary engine without a super charger, the downward piston movements during the intake stroke create the vacuum in the intake manifold which is used to draw the air-fuel mixture with the carburetor into the cylinder. With super charging, however due to high pressure the density of charge maximizes and therefore, its weight per stroke is raised for the same swept volume. The supercharged engines gives more output because power output of engine is almost directly proportional to the weight of charge per minute.

Turbocharger-
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.

1.1. COMPONANTS OF KINETIC CHARGER

Impeller- It is the circular section made up of galvanized sheet. It is mounted on the shaft, which rotate with the shaft. When the impeller rotates the atmospheric air becomes pressurized due to the close area between the impeller and diffuser ring. The shaft is rotated with the help of fan which rotates due to atmospheric air.

Fig 1. Impeller

Diffuser Ring- The diffuser ring made up of the galvanized sheet. The diffuser ring is used to diffuse the atmospheric area to pressurize it. It is stationary part and mounted on casing with the help of rivet.

Fig 2. Diffuser Ring

Fan- The fan is major rotating member which is made up of the plastic material. The fan is attach to the one end of the shaft and rotate the shaft with the help of the atmospheric air which rotates the fan when vehicle runs.

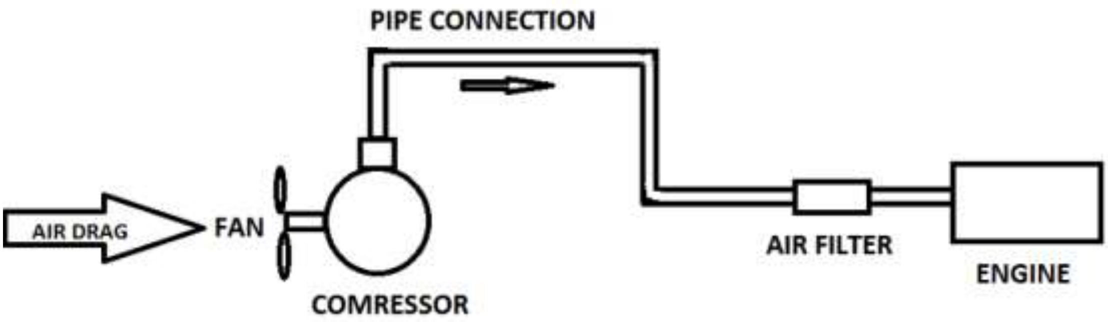
Fig 3. Fan

Casing- The casing is circular section and made up of galvanized sheet. The impeller and diffuser ring covered in casing. Casing is closed body that form by suction and exhaust port.

Shaft- The shaft is the circular in cross section and long rod which is made up of mild steel. One end of shaft attach to the impeller and the another end is attach to the fan which rotate the shaft with the help of the atmospheric air, when the vehicle runs.

2.WORKING

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.



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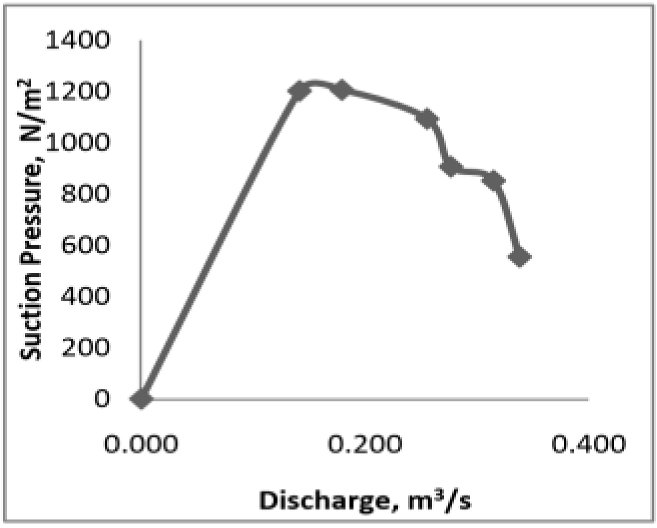
3. CALCULATION

Experimental Optimization of Finite Number of Blades under Varying Speed Conditions -The stage 1 of phase 1 is designed to study the influence of suction pressure on performance of centrifugal fan. The design point parameters were 1150 Pa static stage pressure rise at 0.417 m^3/s volume flow rate and speed of impeller 2800 rpm [30]. The number of blades is varied in four steps of 8, 12, 16 and 24. The suction pressure is varied with the help of orifice plates of different diameter. Suction pressure variation is carried out by using six orifice plates of diameter 80, 90, 110, 120, 130,150 mm and full closing of suction duct to get no flow conditions. shows experimental setup developed for phase 1 experiments and measurements. Here, suction pressure variation lies in the range of 167 N/m^2 to 1364 N/m^2. Observation Tables are given in Annexure C for this phase of experiments. Figure 6.1 to Figure 6.4 shows graphical presentation of the distinctive results obtained under first stage of experiments for 8, 12, 16 24 numbers of blades, respectively.

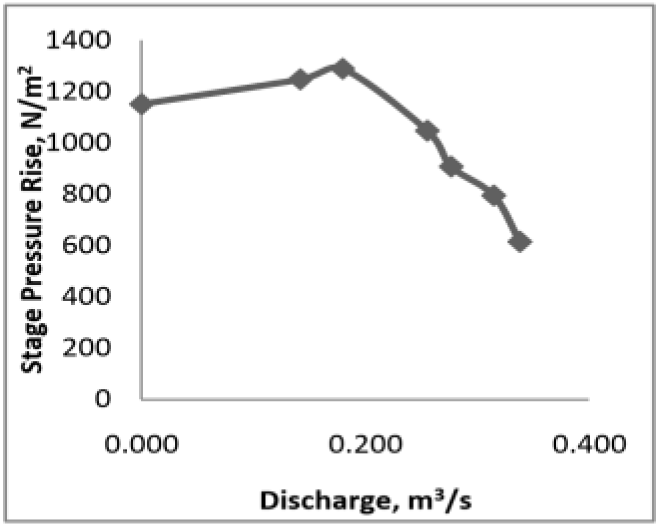
It is observed that with increasing suction pressure, the discharge gradually increases and achieves maxima at 0.338 m^3/s at 429 N/m^2 suction pressure in case of 8 numbers of blades. The nature of the curve is parabolic in shape. When suction reduces, the system resistance reduces and hence fan is capable to handle higher discharges. When suction resistance increases, the losses increases and the discharge begin to drop with further increase in suction pressure. It seems to be stabilized at 1289 N/m^2, in the discharge range of 0.179 to 0.255 m^3/s for 8 numbers of blades. Further increase in discharge leads to decrease in static fan pressure rise. The performance of the fan in terms of shaft power consumed with respect to change in discharge for 8 numbers of blades. Initially flat curve is observed for shaft power up to discharge level of 0.255 m^3/s**.** For 8 blades, the static and stagnation stage efficiencies evidently increases quite sharply with increase in discharge up to 0.255 m^3/s, and there after the static and stagnation stage efficiency improves gradually to attain maxima of 55% and 76% at 0.255 m^3/s and 0.315 m^3/s discharge. The static and stagnation stage efficiency behavior slightly differs due to differences in velocity head at different centrifugal fan flow sections. These results are also quite in tune with published performance curves of centrifugal fan [6, 13, 28] . It is worth noting that the optimum performance of the fan is achieved at a static pressure rise of 1060 N/m^2 at discharge of 0.301 m^3/s with 88% stagnation efficiency. This means that this performance is quite away from the design point performance which was targeted to be 0.417 m^3/s discharge at 1150 N/m^2 static stage pressure rise. This underlines the need for critically evaluating the design guidelines for suction sides. Table summarizes the optimum performance parameters obtained during phase 1 under constant speed of rotation as 2800 rpm.

4. RESULTS AND DISCUSSION

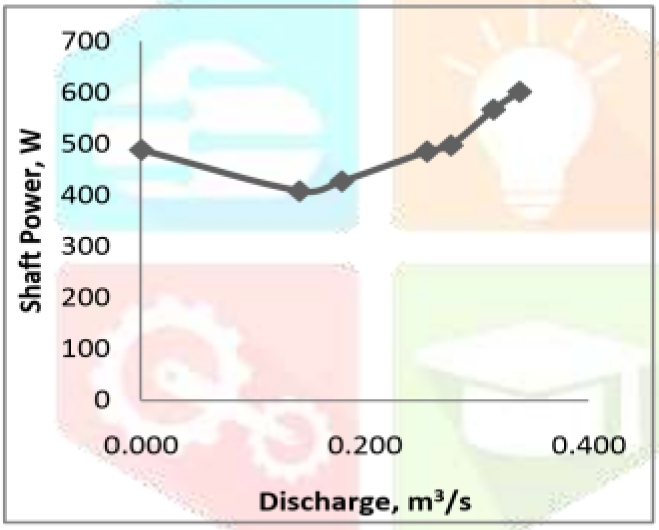
We have designed and fabricated a prototype of the kinetic charger which will be implemented in Two-wheeler. In which the efficiency of the Engine can be increased. Thus we have developed a method to increase the efficiency of the engine and at the same time to control the Emissions from the engine. The experimental setup of block diagram is shows the arrangement of kinetic



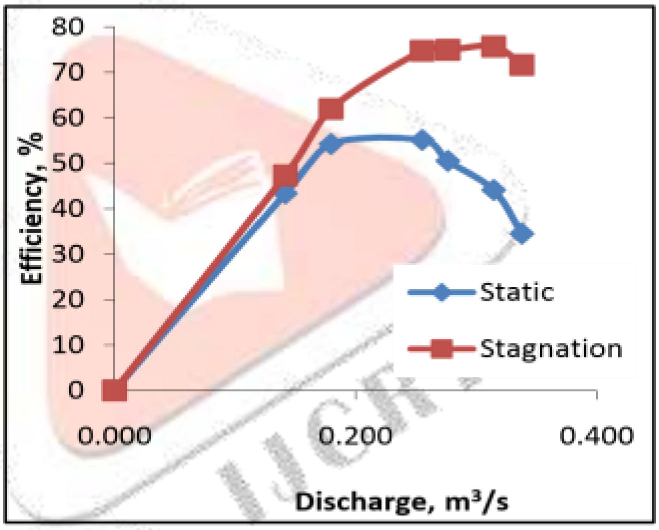
(a) Suction Pressure Vs. Discharge



(b) Static Stage Pressure Rise Vs. Discharge



(c) Shaft Power Vs. Discharge



(d) Efficiencies Vs. Discharge

charger in two-wheeler. This type of engine will be more efficient than existing engines

Fig. of Performance curve

Table 1.Optimum performance parameters as a Function of Number of Blades

No. of Blades	**Pressure Developed**		**η Static**	**η Stagnation**	**Max. Discharge**
	Δp Static N/m^2	**Δ p Stagnation N/m ^{2}**	**Max.**	**Max.**	**m^3/s**
8	1290	1473	55.1	75.7	0.338

5. ADVANTAGES OF KINETIC CHARGER

- 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

6. CONCLUSION

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 .This type of engine will be more efficient than existing engines.

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