Research Paper

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Fabrication of Efficiency Increaser by Using Preheating Method

Engineering

KEYWORDS : preheating, efficiency, exhaust gas, low cost

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ABSTRACT

An attempt has been made in this research work to use preheating of exhaust gas is giving to input of ignition in Two/Four Stroke engine to increase the efficiency. Our foremost aim of selecting this research is to use efficiency increasing. It is also good with regard to economic considerations and engine efficiency. A method and system for preheating internal combustion engine fuel to an optimum temperature before introducing the fuel into the carburetion system. The two wheeler engine is an internal combustion engine. It is a device, which converts the thermal heat energy from the exhaust and converts it to air preheat. Also the atmospheric air is fixed over the silencer for intake the hot air to the carburetor. The concept of increasing the fuel efficiency of a petrol engine in this research is to pre-heat the intake air which is flowing through the carburetor. The humidity in the atmospheric air affects the petrol vaporization in the carburetor . Therefore, by pre-heating the inlet air to the carburetor for a considerable amount, the vaporization can be easier and in turn complete combustion is achieved.

INTRODUCTION

The output of the engine exhaust gas is given to the input of the ignition system, so that the proper ignition is occurred. In this case, the efficiency of the engine is also increased. The exhaust gas is given to the heating chamber as shown in figure. The exhaust hot air is used to pre-heat the input air into the ignition system. Preheating is basically a volatile liquid fuel mixture of hydro carbons. As described already it is a byproduct during the distillation of crude mineral oil and refining it further by other processes. It does not have a fine composition. The constituents vary depending upon the origin of the crude mineral oil. The important properties of preheating are given below.

Volatility

It is determined by the Reid vapour pressure which can vary from about 50 to 120 Kpa at 40˚C.

Specific gravity

It lies in the range of 0.1 to 0.75 sometimes instead of specific gravity A.P.I. index of gravity is used.

Calorific value

It is about 45 MJ / Kg.

Specific heat

It is nearly 2.1 KJ / Kg.K

ENGINE CONSTRUCTION

In this work we use spark ignition engine of the type two stroke, single cylinder of Cubic capacity 75 cc. The Engine has a piston that moves up and down in the cylinder. A cylinder is a long round air pocket somewhat like a tin can with a bottom cut out. Cylinder has a piston which is slightly smaller in size than the cylinder the piston is a metal plug that slides up and down in the cylinder Bore diameter and stroke length of the engine are 50mm and 49mm respectively.

Engine specification

Engine	: Spark ignition.
Type	: Two stroke single cylinder air cooled engine.
Intake System	: Normal aspiration with Reed valve.
Bore	: 50mm.
Stroke	: 49mm.
Cubic capacity	: 75cc.

Performance

Horse Power	: 2.5 kw.
Torque	: 4.3 Nm.

The Engine is welded to the base plate. Wheel of 550 mm diameter is connected to the engine with the help of chain drive.Figure1 shows the efficiency increase by using preheating method.Figure 2 shows the layout of preheating chamber.

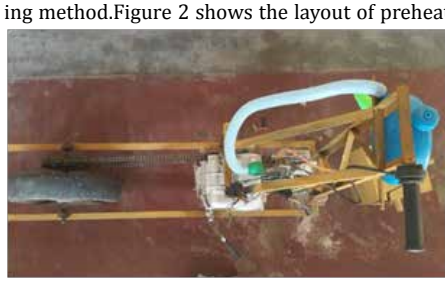

Figure:1Efficiency increase by using preheating method.

Figure: 2 Layout of preheating chamber.

AIR PRE HEATER

The first problem is selecting suitable materials to serve the design purpose. The material should also be locally available. It should be best studied and also cheap in cost. The materials for baffle plates and tubes shall be decided first. Baffle plates and tubes should have very good thermal conductivity. It should also be resistant to chemical corrosion as well as erosion. Some of the materials that can be considered are copper, brass, aluminum and steel. Copper has better heat conduction characteristics, but it is not recommended because of its high cost. Also copper is susceptible to easy corrosion. Regarding thermal conductivity aluminium has good thermal conductivity and it is much greater than that of steel.

Aluminium =150 kcal/m-hr-c
Steel =45 kcal/m-hr-c

Aluminium is also highly resistant to corrosion attack.Aluminium is light in weight and it also has a bright appearance.Steel has the following advantages:

- It is easily available
- Steel also has good weld ability

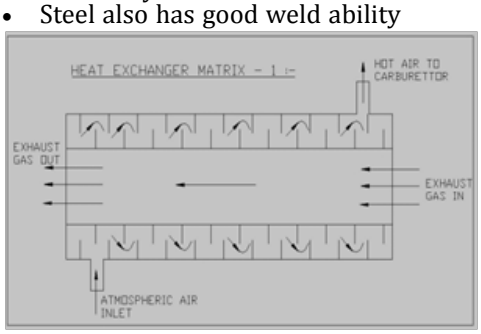

Figure: 3Heat exchanger matrix-1

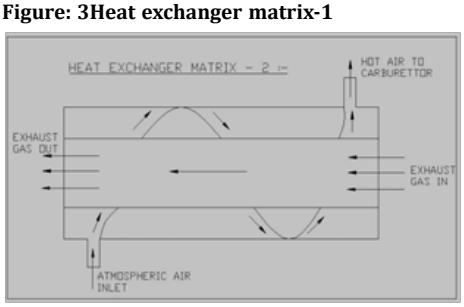

Figure :4 Heat exchanger matrix-2.

SELECTION OF HEAT EXCHANGER MATRIX

The matrix, selection for the heat exchanger should be convenient for fabrication and should be effective.

Matrix-I

This type of staggering and overlapping assembly can be used for heating the air. This type provides a good passageway for air. But it is difficult to fabricate such a small heat exchanger like this. So this is rejected. Figure 3 shows the heat exchanger matrix-1

Matrix – II

This is another type of heat exchanger in which the air passed through a spiral path. It is also a good type of matrix, because turbulent flow will occur when air is flowing through the spinal path. In this type we can get an effective heat transfer. This has no great fabrication or brazing difficulty. So, this matrix is selected. Figure 4 Shows the heat exchanger matrix-2.

HEAT CHAMBER

A heat chamber is an exhaust system used on a two-stroke cycle engine to enhance its power output by improving its volumetric efficiency. It makes use of the energy left in the burnt exhaust exiting the cylinder to add the filling of the cylinder for the next cycle. It is the two-stroke equivalent of the tuned pipe (or headers) used in four-stroke cycle engines

Working

The high pressure gas exiting the cylinder initially flows in the form of a "wave front" as all disturbances in fluids do. The exhaust gas pushes its way into the pipe which is already occupied by gas from previous cycles, pushing that gas ahead and causing a wave front. Once the gas flow itself stops, the wave continues on bypassing the energy to the next gas downstream and so on to the end of the pipe. If this wave encounters any change in cross section or temperature it will reflect a portion of its strength in the opposite direction of its travel. The basic principle is described in wave dynamics. A heat chamber makes use of this phenomenon by varying its diameter (cross section) and length to cause these reflections to arrive back in the cylinder at the desired time in the cycle. An approximation of a heat chamber in operation. It does a good job illustrating the positive portion of the exhaust pulse, however, there are several errors in this animation: The exhaust would not go all the way through the pipe in the 1 cycle. Neither does it show the suction wave generated by the diverging section. The fresh mixture drawn into the header pipe cannot go all the way down the header pipe. There are three main parts of the heat cycle.

EMISSION MEASUREMENT

The MEXA-584L simultaneously measures CO, HC, CO_2 (non-dispersive infrared: NDIR) and air-to-fuel ratio (AFR) or excess air ratio (A) in idle state. lt optionally measures O2, NO, engine speed (RPM) and oil temperature (TEMP). Lightweight and compact with a clear LCD and effortless operation, it can be used as a simple Measurement instrument in any work situation

Estimation of CO, Hydrocarbon CO2 and NO

The exhaust emissions of gasoline-powered vehicles for CO and Hydrocarbon were monitored using an Automotive, Emission Analyzer MEXA-584L idling conditions, 1/4 throttling, 1/2 throttling, 3/4 throttling and full throttle conditions. The MEXA-584L simultaneously measures CO, HC, CO2 (non-dispersive infrared: NDIR) and air-to-fuel ratio (AFR) or excess air ratio (A) in idle state.

RESULTS AND DISCUSSIONS

CO and Hydrocarbon emissions

Variation in CO and Hydrocarbon emissions of two wheel vehicles.i.e Suzuki engine (Two strokes) at idling engine conditions and maximum possible load conditions are provided in table 1 to 4.About 90% of scooters and 85% of motor bikes were found emitting CO within the prescribed national standard of 4.5%.About 33% of scooters and 83% of motor bikes were found emitting Hydrocarbon within 2000 ppm.The low percentage of scooters emitting Hydrocarbon in the said range might be attributed to the fact that all scooters tested were having two stroke engines while a few models of motor bikes had four strokes engine as well which do not require pre-mixing of mobile oil in petrol as lubricant. No national standards are prescribed for Hydrocarbon emissions from vehicles at idling conditions.

Vehicles of various make and models are use in Chidambaram. The most common among the two wheel gasoline vehicles are Hero Honda motor bike(4 stroke,100cc),Yamaha motorbike(2stroke 100cc) Tvs jive motorbike, Tvs flame motorbike 125cc,Bajai platinum motorbike, Tvs xl motorbike, Apache motorbike,Bajai Discover 135cc motorbike, Bajaj Pulsar 150cc DTS-I motorbike etc. Here the authors measured the emission characteristics [(Carbon monoxide (CO), Hydro carbon (HC), Carbon dioxide ($CO_{2)}$ and Oxides of Nitrogen (NOX)] of Suzuki engine using Gas analyzer.

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Table 1 Carbon monoxide (CO) emission characteristics of two wheel gasoline vehicles (two stroke) (In %)-Without Heating chamber.

Vehicle name	Vehicle model	Idling	25%	50%	75%	100%
Suzuki engine100 cc	2006	4.80	5.20	5.51	5.45	7.19

Table 2 Hydro carbon (HC) emission characteristics of two wheel gasoline vehicles (two stroke) (In %)-Without Heating chamber.

Vehicle name	Vehicle model	Idling	25%	50%	75%	100%
Suzuki engine100 cc	2006	800	715	650	514	575

Table 3.Carbon monoxide (CO) emission characteristics of two wheel gasoline vehicles (two stroke) (In %)-With Heating chamber

Vehicle name	Vehicle model	Idling	25%	50%	75%	100%
Suzuki engine100 cc	2006	4.00	4.84	5.02	5.14	6.80

Table 4. Hydrocarbon (HC) emission characteristics of two wheel gasoline vehicles (two stroke) (In %)-With Heating chamber.

Vehicle name	Vehicle model	Idling	25%	50%	75%	100%
Suzuki engine100 cc	2006	740	681	574	475	510

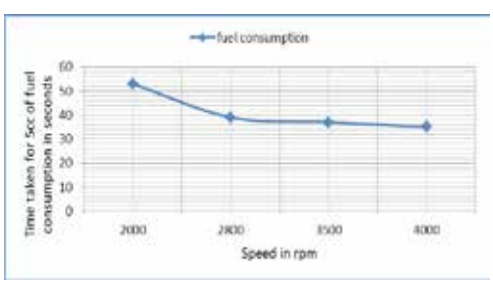

Figure 5.Characteristic curve for a Suzuki engine with engine oil.

During half throttling about 90% of scooters and 93% of motor bikes were found to emit HC within the prescribed national standard of 2000 PPM.The low percentage of scooters emitting Hydrocarbon in the said range might be attributed to the fact that all scooters tested were having two stroke engines while a few models of motor bikes had four strokes engine as well which do not require pre-mixing of mobile oil in petrol as lubricant. Figure 5 shows the characteristic curve for a Suzuki engine with engine oil.

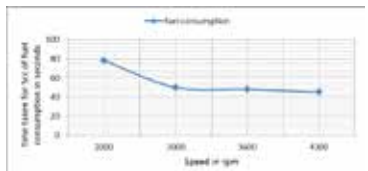

Figure 6. Characteristics curve for a Suzuki engine without engine oil.

During full throttling about 52% of scooters and 47% of motor bikes were found to emit HC not within the prescribed national standard of 2000 PPM.The low percentage of scooters emitting Hydrocarbon in the said range might be attributed to the fact that all scooters tested were having two stroke engines while a few models of motor bikes had four strokes engine as well which do not require pre-mixing of mobile oil in petrol as lubricant.Figure 6 shows the characteristic curve for a Suzuki engine without engine oil.

CONCLUSION

Thiswork adventured by us is the one that can be used for both preheating and efficiency. Even though it is complicated to convert to gas in four stroke engine, we have entered into this project. We have done the project with simple in construction by lower expenses. This is one of the advantageous project conserving the cost and scarcity of preheating. The compression ratio of the engine is from the efficiency which we have avoided for the reason that if we suit the engine for it will not work with preheating. Road test and load test had been carried out for testing the condition of engine with efficiency and compared with preheating. The chain sprocket is used to increase the rpm of the engine. This is tested and the project was successfully completed. In future this project can be modified by hiding all the open parts into one unit which we haven't now because of insufficient time for new designing.

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