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Experimental Investigation of Effect of Emission Control Techniques for Aged Commercial Vehicle

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ABSTRACT: Now-a-days the automobiles are very essential needs of human beings. The world without automobiles is unimaginable at present. But the major problem corresponding to the automobiles are unwanted emissions from the engine exhaust. The unwanted emission contains CO, CO₂, HC, SOX, NOX, etc. Control of these gases is very essential now, because it leads to harmful injuries to living beings and environment. So, we are going to use three methods to reduce these exhaust emissions. These are adding additives methods which can reduce the of CO₂ gas emission from the vehicles. Then HHO technology may be used to improve the fuel consumption & reduce CO₂, NOX level during the combustion process. Then the exhaust gas is then treated with Aqua Silencer. The reduction techniques can be used to reduce the emission from used vehicles and further increase the usage period.

I. INTRODUCTION

In today's time the pollution caused by vehicles is more harmful to environment and nature. The emissions caused by the burning of fuel from exhaust are decreased in developing engines (BSIV & BSXI) vehicles. The emissions produced in BS III engines are analyzed. The vehicle emission increases with time and improper maintenance. In a country like India it is harder to stop the running of all BS III vehicles hence we have decided to reduce the emission from these engines by proposing some methods. The emission of BSIII vehicle is completely analyzed. The methods suggested are implemented and the engine is analyzed again. The existing engine emissions can be reduced by these methods and the bikes can be used for a longer time. The BSIII engine emissions are Carbon Monoxide 2.30 g/km, HC 0.20 g/km, and NOX 0.15 g/km. By implementing the suggested methods, the emission of CO, HC and NOX can be reduced. The BS III engine we chose is from Bajaj Pulsar of three different years.

II. RELATED WORK

Exhaust Emission Level reduction process in SI Engine by Isopropyl Alcohol as Gasoline Additive by Arul Thayammal Ganesan, Varatharaju Perumal, M. Abdul Kareem, and GetachewTotsaBisam 2020 [1]. The formation, Effects and Control of Oxides of Nitrogen in Diesel Engines by Maroa Semakula, Prof Freddie Inambao 2018 [2]. Emission analysis of an SI engine with humidified air induction by Murat Kapusuz, Abdulvahap Cakmak, Hakan Ozcan 2018 [3]. Experimental Investigation of Emission Control in IC Engines by Introducing Various Techniques by Rajeshkumar G, Rajapandian R, Surendrakumar G, Ananthakumar P., Vasanthaseelan S., and Senthil Ganesh A. 2016 [4]. Experimental Investigation of Emission Control on CI Engine Using Gold Base Catalytic Converter by Savitribai Phule 2007 [5]

III. METHODOLOGY

The problem to be solved is identified and the related literature papers are studied to understand the source of problem and arrive at a solution. The proposed solutions are studied and necessary needs are fulfilled. The Engines on which the experiment to be made is chosen and analyzed for the emissions. The proposed techniques are performed and the emissions are analyzed. The results prior to performing techniques and after performing the techniques are compared

and a graph is plotted. Finally, a suitable method to reduce the emissions is proposed. The BSIII vehicles are selected in order to increase the vehicle usage time and reduce the emissions. The vehicles are selected based on proposed criteria and the various techniques are employed. The HHO process is first done by passing hho gas with inlet air. Then additives are added with fuel and emission test is taken. Finally Aqua silencer method is used.

IV. EXPERIMENTAL WORK

In this project we choose three vehicles for the emission test process by using three different tests.

- a) Hydrogen-Hydrogen-Gas (HHO)
- b) Aqua Silencer
- c) Additives

An emission test cycle is a protocol contained in an emission standard to allow repeatable and comparable measurement of exhaust emissions for different engines or vehicles. With the help of a device, the PUC Centre will scan your vehicle's exhaust pipe and take readings of the pollution levels.



a) Pulsar Fitted with HHO Kit



b) Pulsar fitted with Aqua Silencer



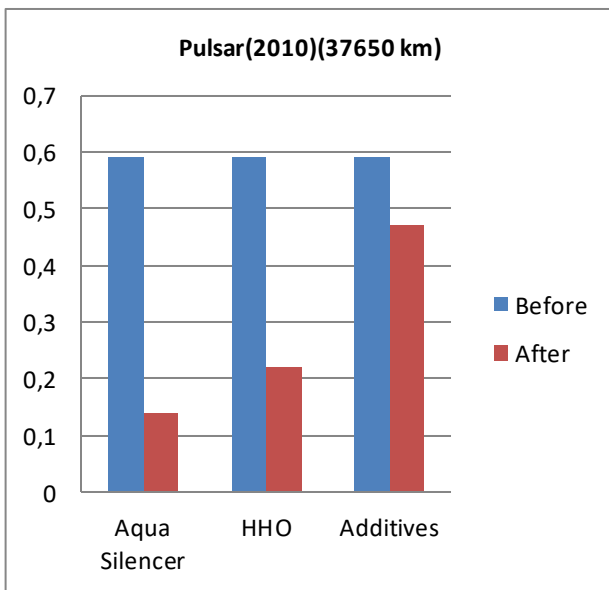
c) Additives used for Reduction process



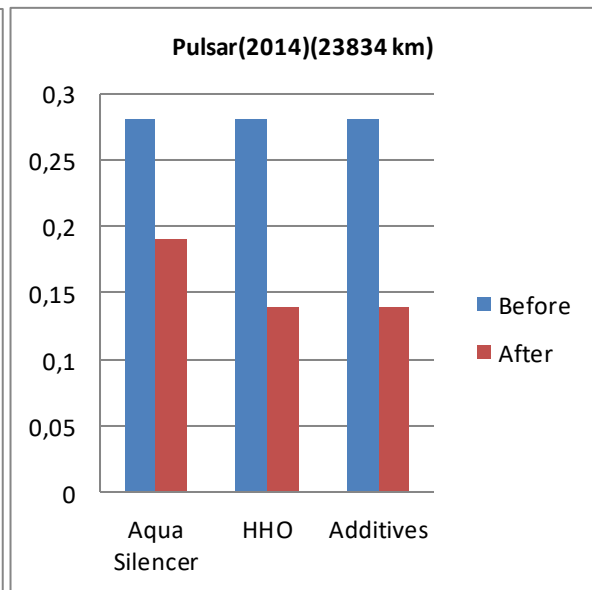
a) The HHO kit is fitted in the bike by connecting with the battery terminals and inlet tube. The HHO gas is passed along in the inlet tube to increase combustion and reduce the pollutant levels. b) The aqua silencer is used in place of default silencer and this reduces the CO levels and noise produced in the vehicle. c) The additives chosen are 2-ethoxy ethanol and 2-methoxy ethanol which increases the combustion and ensures complete burning of fuel.

V. RESULT DISCUSSION

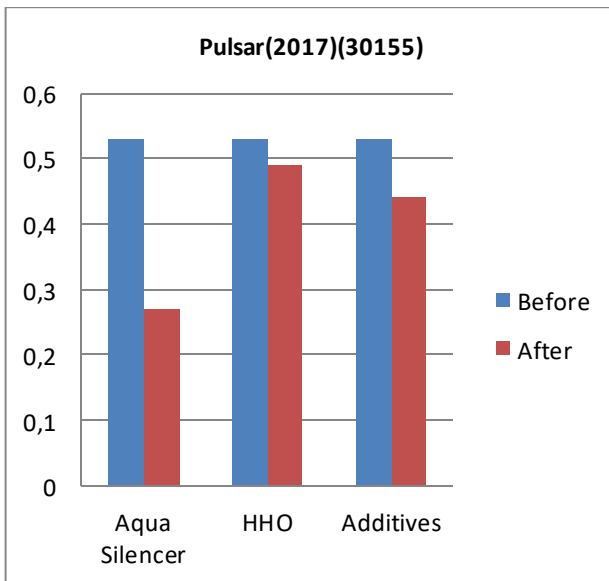
The results obtained from the various emission tests are tabulated and compared before and after performing the reduction techniques.



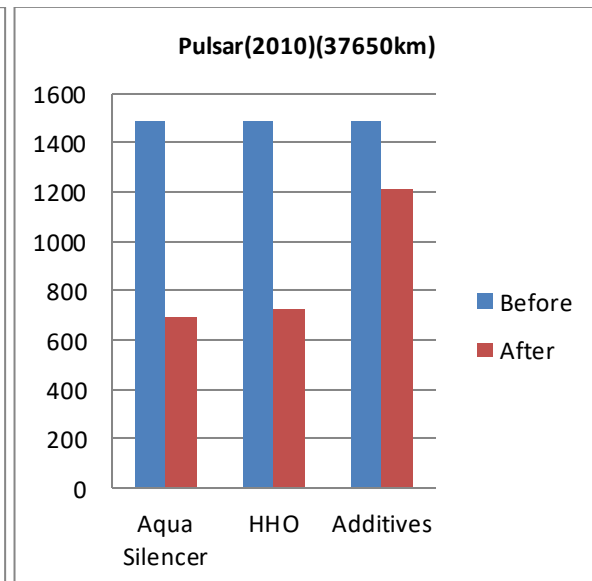
a) Comparison of CO for Pulsar 2010



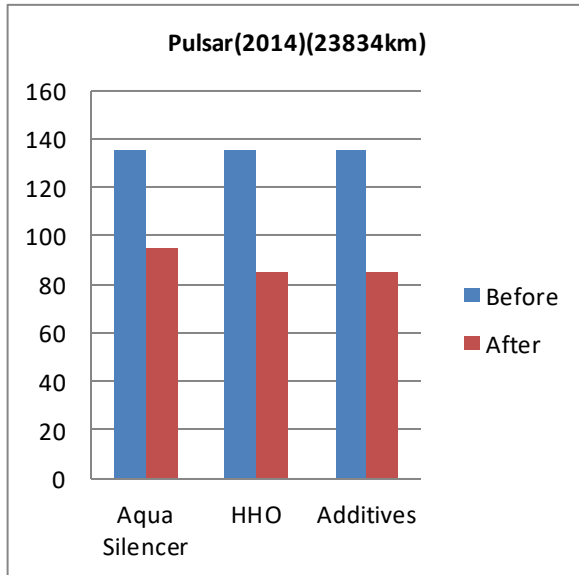
b) Comparison of CO for Pulsar 2014



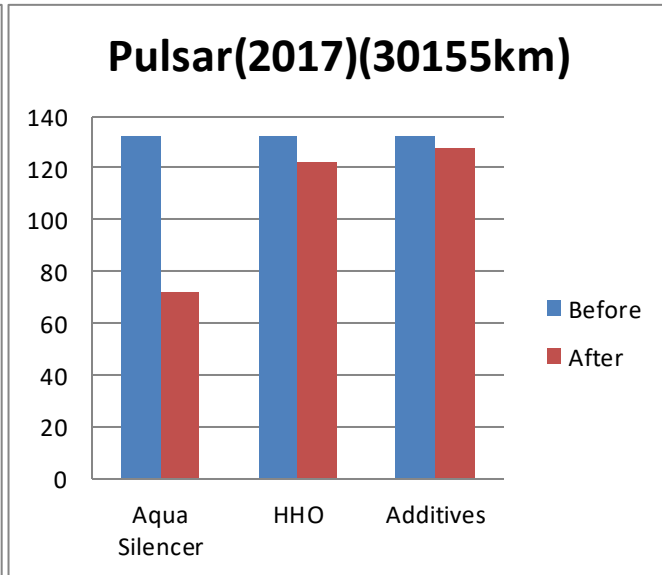
c) Comparison of CO for Pulsar 2017



d) Comparison of HC for Pulsar 2010



e) Comparison of HC for Pulsar 2014



f) Comparison of HC for Pulsar 2017

Using of HHO gives good results at reducing the CO and HC content of vehicles and is economical compared to using Aqua Silencer which is quite difficult to implement.

VI. CONCLUSION

Today’s vehicles are meeting emission standards that require minimizing of up to 99% of toxic elements compared to the uncontrolled stages of automobiles sold in the 1960’s. Ecological and Health concern result in higher stringent emissions regulations of pollutant emissions from automobile engines. In this work we are mainly focused on the reduction of CO and HC from vehicle exhaust and increase the life time usage. It is also focused on the improvement of engine life, engine efficiency and minimizes the fuel consumption while doing so. Uses of aqua silencer, additives and HHO are the accurate way to stop the auto exhaust emissions. The methods we have proposed are very effective and methods like HHO and Additives are very economical and effective in reducing the emissions. The results before performing and after performing the results were tabulated and compared to find the reduction of emissions. It is found that the reduction techniques are very well effective in reducing CO and HC emissions. HHO method of emission control is effective and economical than the other two suggested methods and is very easy to implement compared to Aqua Silencer.

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