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Extended Abstract

Control of Carbon Dioxide and other Emissions from Diesel Operated Engines using Activated Charcoal

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Abstract

Carbon dioxide is a major cause of natural calamities and changes in climatic conditions. Of all the sources of emission, the amount of carbon dioxide from automobiles is approximately 65%, which is more than any other sources of emissions. Raise in carbon dioxide content in atmosphere is causing global warming which is evolved from greenhouse gases. To reduce the emission and control of carbon dioxide percentage in atmosphere form automobiles, theoretical and practical methods of adsorption of carbon dioxide using activated charcoal (carbon) in diesel operated engines is conducted. Charcoal is one of the best adsorption material due to its high pours valve and capture capacity, when reacted with other reagents in order of activation, it increases its adsorption capacity than that of regular charcoal. In this project the activation of charcoal is steam activation. The amount of carbon dioxide exhausted from diesel engine in ideal condition and after the reactor chamber is added to the exhaust system the content of carbon dioxide is controlled up to 9.266%.

Keywords:

Control of carbon dioxide; Adsorption; Activated charcoal; Steam activation; Emission; Smoke test

Introduction

Carbon dioxide is the one of the gases in atmosphere bearing percentage of 0.04, it plays an important role in maintaining optimal condition of earth by enriching photosynthesis in plants and other benefits, but it has also become a major issue in the recent decade due to its increase in percentage leading to increasing the global temperature, which causes melting down of glaziers and increasing water levels, heavy changes in temperature.

There are two major sources of carbon dioxide, natural and human. Natural sources are ocean-atmosphere exchange, plant and animal respiration, soil respiration and decomposition and finally volcanic

Eruption. Human sources are fossil fuel usage, land use changes and industrial process. Carbon dioxide is the primary greenhouse gas emitted through human activates, the main activate that emits carbon dioxide is the combustion of fossil fuels (coal, natural gas and oil) for energy and transportation, although sustain industry process and land use changes also emit carbon dioxide. The main sources of carbon are diode, car, electric, transportation and industry. Carbon dioxide is constantly being exchange among the atmosphere, ocean and land surface as it both produce and adsorb many microorganism, plants and animals.

Experimental layout

This flow chart explains about experiential work that deals with the adsorption of carbon dioxide. The diesel operated engine's exhaust is connected to the after-treatment system, which leads to muffler which reduces the turbulence or the flow in gases and passes through the intermediate valve. Which is connected to two way valve, where the connection leads to atmosphere and the other leads to a experiential setup connected to flow meter, in the first connection, when there is Over flow of gases, open the two way valve to the atmosphere till we get the constant flow. If a constant flow is generated then we close the secondary valve and open primary valve which is connected to flow meter. Flow meter now shows the mass flow of gases from the exhaust towards the reactor chamber

Then further a two way valve is fixed to collect the sample gas and measure the content of gases present in the flow, this flow of gas is passed through the reactor chamber where the reaction (adsorption) is taken place and then a second sample is taken to measure the content of gases absorbed in the reaction chamber. Then the gases are passed out the atmosphere

Design Validation

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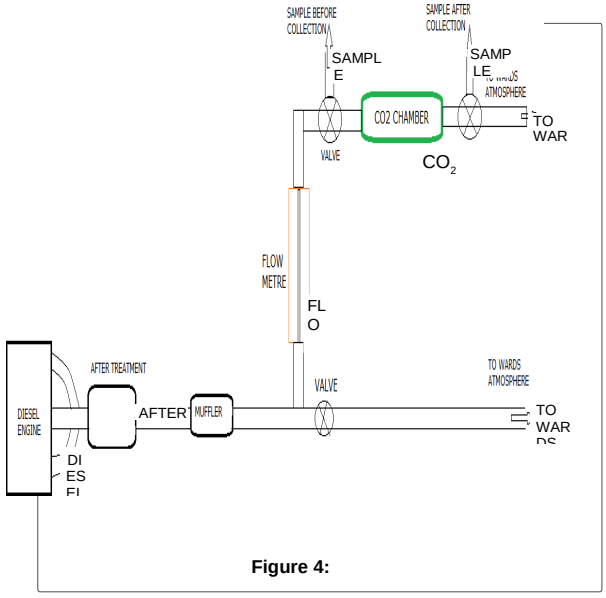

Figure 4:

Expermental Procedure

The test on Co_2 reactor chamber is conducted on Volkswagen Jetta TDI 2.01 with automatic transmission. AVG gas analyser is used to measure the content of gases and their percentage present in the exhaust

Layout assembly and procedure of testing

- Initially the reactor chamber is prepared by placing wire mesh with activated charcoal in it and fixed to the fabricated layout.
- Flow meter is now connected to the setup and placed vertically.
- Now the tailpipe of the vehicle is connected to the flow meter using two way valves in the procedure, which is used to regulate the flow of the exhaust in to the setup or to the atmosphere. There are two way valves placed in front of the reactor chamber and next to the chamber which are used to collect the sample gases, by which the content of gases can be determined.

Results and Discussions

After performing the testing on the setup according to variation on rpm, sample gases are collected to test the percentage of various gases present in it, before and after the testing is performed. The results are as follows

Sl No	Condition	Rpm	Content	Mean	Percentage	Over-all
1	Idle	800	2.56	0.26	10.5%	9.266 %
	After	800	2.3			
2	Idle	1700	3.93	0.44	11.1%	
	After	1700	3.49			
3	Idle	2400	3.70	0.25	6.2%	
	After	2400	3.45			

Conclusion

In this experiment we have successfully controlled emission of carbon dioxide from the diesel operated engines, which is about 9.266% of the overall emission from a vehicle. Through this other gases has also been controlled like hydro carbon, nitrogen, carbon monoxide and particulate matter.

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