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Purification by Diesel Engine Exhaust System

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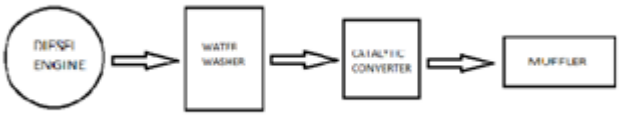
Abstract: ***This article is a literature review of purification by diesel engine exhaust system. In today modern world of globalization and industrialization the condition of environment is depleting at a fast rate. Air pollution is major problem worldwide, and is causing severe damage to life and properties. Motor vehicle emissions contribute to air pollution and are a major ingredient in the creation of smog in some large cities. A 2013 study indicates that 6,00,000 early deaths occur per year in the world because of vehicle emissions. The proposed emission control system comprises of a water washer, exhaust manifold preparation and after muffler and catalytic convertor. The whole system should work for the entire life of the involved engine experimentation. This arrangement can be critically evaluated against the option of shifting both the engines. The shifting involves a little foundation arrangement. In the effort of controlling the particulate matter and the emissions from different sources of such pollutants, the proposed low cost emission system opts to be the perfect choice.***

Keywords: Internal Combustion Engine, Muffler, Exhaust System, Water-Washer System, Purification, Catalytic Convertor, Multi-point sprinkler, Pollution control

1. Introduction

Reciprocating internal combustion (IC) engines are used in a variety of stationary applications, including gas compression, pumping, power generation, cogeneration, irrigation and inert gas production. Operation of stationary internal combustion engines resulting in the emission of criteria air pollutants, such as hydrocarbons (non-methane hydrocarbons [NMHCs] or volatile organic compounds [VOCs]), carbon mono-oxide (CO), nitrogen oxides (NOx) and particulate matter (PM). Exposure to these pollutants is associated with numerous Effects on human health, including increased difficulty in breathing, hospitalization for heart or lung disease, and even premature death are seen. The air pollutants (i.e., hazardous air pollutants [HAPs]) emitted by stationary engines are formaldehyde (CH2O), acetaldehyde and methanol. People exposed to sufficient concentrations of toxic air pollutants and the duration of an increased chance of developing cancer or to experience other serious health effects. And thus a detailed experiment which contain the quality of air in terms of concentration of these pollutants is carried out here and thus a system was installed whose efficiency is also shown with analytical results and plausible solution to the effects of exhaust gas on human health.

2. Path of Exhaust Gas



Water Washer:
We used water washer as first component to reduce macro-particles emitted from diesel engine exhaust. Water washer basically helps in settling down the heavy particles of flue gas using multi point sprinkler.

Catalytic Convertor:
A catalytic converter is an emissions control device that converts toxic gases and polluants in exhaust gas to less toxic pollutants bya redox reaction (an oxidation and a reduction reaction). We used Three-way catalytic convertor in our system which control emission of nitric oxide.

Muffler;
Muffler is used to minimize the noise produced by the engine. It also reduces back pressure. Too much back pressure reduces engine efficiency.

3. Parameters

1) Sulfur Dioxide (SO2)
2) Oxides of Nitrogen (NOx)
3) Ammonia (NH3)
4) Carbon Monoxide CO

4. Methodology

First, gas samples of exhaust gas without the above mentioned exhaust system were taken.

Bladder was used to collect samples for each parameter mentioned above. Then, it was sent to The Green Circle Laboratory for further analysis.

Next, exhaust system was installed to a diesel engine exhaust. Samples were collected again and sent in the same way as before. Results from The Green Circle Laboratory is shown below.

5. Result

Client Details		***Sample Details***	
Name	M/s. Babaria Institute of technology	***Sample Code***	GCI/V/17/C2/WP1
		Location	Mechanical Deparment
Address	Vadodara Mumbai NH-8, Varanama, Vadodara, Gujarat	***Quantity***	NA
		Date of Sampling	10/3/2017
		Date of Received	10/3/2017

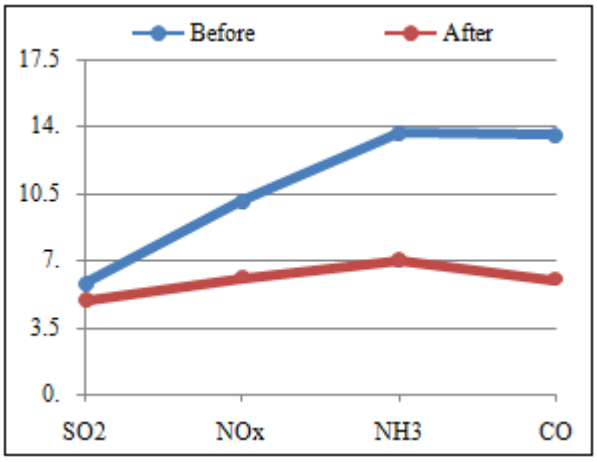
	391240.		
Sampling Done By	Mr. Kartik Patel	***Sampling Instrument***	Handy Sampler
Date of Analysis	11/2/2017		
Date of Completion	13/02/2017	***Sampling Method***	As per Instrument Manual

Work Place Analysis Results

Sr. No.	*Parameters*	*Before* (mg/m^3)	*After* (mg/m^3)
1	SO_2	5.8	4.9
2	*NOx*	10.1	6.1
3	NH_3	13.7	7
4	*CO*	13.6	6

Remark: Results are within limit as per Permissible Limit as per factory act 1948

6. Graphical Representation



7. Conclusion

After installing the exhaust gas purification setup, the working environment of the lab for performing the experiment as well as after performance atmosphere became more desirable. Also the particulate matter in the flue gases were reduced to a great extent. The harmful and hazardous gasses were converted to less harmful gasses by a redox reaction. Also reduction of temperature by convection heat transfer as an extra by-effect is obtained which is profitable. Thus, overall health of the students and that of the faculty as well as the lab atmosphere is optimized.

8. Visual Conclusion

The amount of smoke emitted is reduced to a negligible amount. The black smoke due to the carbon content of the the gas is non existent after the installation and a clear to transparent exhaust gas is seen ,thus resulting in a good working environment.

Statistical conclusion

According to the reports ,the reduction that was seen in the gases is as follows:-
SO2 is reduced by a 15.5%.
NOx is reduced by 39.6%.
NH3 is reduced by 48.9%.
And CO is reduced by 55.9%.

References

[1] J. E. Cole and R. A. Dobbins. Measurements of the attenuation of sound by warm air fog. Journal of the Atmospheric Sciences, 28:202–209, (1971).
[2] 2010, Mehmet Avcu, ŞadiKopuz and Mehmet Teke." DIESEL ENGINE EXHAUST SYSTEM DESIGN "" Journal of Naval Science and Engineering 2010, Vol. 6, No.1, pp. 39-58.
[3] The information from the Vadodara's pollution under control center was referred for the actual working conditions and inputs for a working diesel engine.
[4] The company "GREEN CIRCLE" was approached for quality emission reports on the working of the diesel engine herein used.
[5] Davies P O A L and Holland K R (1999), "IC Engine Intake End Exhaust noise Assessment", Journal of Sound and Vibration, Vol. 223, No. 3, pp. 425-444.
[6] Li Xiaolu, Chen Hongyan, Zhu Zhiyong and Huang Zhen (2006), "Study of Combustion and Emission Characteristics of a Diesel Engine Operated with Dimethyl Carbonate", Journal of Energy Conversion and Management, Vol. 47, pp. 1438-1448.