ALTERNATIVE CATALYST FOR CATALYTIC CONVERTER OF AN AUTOMOBILE

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***Abstract*:- Since last decode automotive exhaust emission is damaging environment and thereby showing negative impact on health of living beings. It is a big challenge for catalytic converter manufacturer to archive tighter norms and standards of pollution control. Technologies developed so far includes improvement in engine design alternate fuels usage additives for fuel exhaust treatment fuel pre-treatment ,EGR, PCV etc. Among of these one of most affordable technique is exhaust treatment by using catalytic converter. It is the best way for abating harmful pollutants like CO, HC, and NO etc. from automotive exhaust. This paper is dedicated to practical experience of latest technologies developed in this view and overcoming some of limitations of catalytic converter.**

***Keywords :* catalytic converter, cold start emissions, fuel exhaust treatment**

1.0 INTRODUCTION

The pollutants have undesirable effect on air quality, environment and human health that tips in stringent norms of pollutant emission. Numbers of different technologies like Upgrading in engine design, fuel pre-treatment, use of alternative fuels, fuel flavours, exhaust treatment or superior tuning of the combustion process etc. are being pain taking to reduce the emission levels of the engine. Out of many technologies available for automobile exhaust emission control a catalytic converter is found to the best option to control HC, CO and NO_x emissions from petrol driven vehicles while diesel particulate filter and diesel oxidation catalyst or oxidation catalysts converter have so far been the most potential option to control particulates emissions from diesel driven vehicle.
A catalytic converter is placed inside the tailpipe through which deadly exhaust gases containing HC, CO, NO_x are emitted. The function of the catalytic convertor is to convert these gases into CO_2, H_2O, N_2 and O_2 and currently, it is necessary for all automobiles pursuing on roads.

2.0 LITERATURE SURVEY

SK SHARMA, P.GOYAL, S.MAHESWARI, A.CHANDRA proposed that automobile pollution can be controlled using three way catalytic convertor. But it is expensive as platinum and palladium belong to same group and are more costly. But result obtained from it is good that controls the unburnt hydro carbons and carbon monoxide.

MOHAN T . TAYDE, DR CHETHANKUMAR M.SEDANI said that gold base catalyst is very low cost compared to noble metals. It reduces the effect of hydrocarbons, carbon dioxide, and nitrogen oxide. It also increases the thermal efficiency of the engine increases, but conversion is done at very low temperature as a result break power increases temperature increases and conversion efficiency decreases. So gold base catalyst is suitable at low level temperature.

TARIG SHAMIM AND SUBRATA SENGUPTA proposed that a numerical model is employed to predict the catalytic convertor performance during cold start. Initial catalyst temperature influences the emission conversion behaviour only during first 65 seconds. If the converter is heated to 600 K or above both HC and CO emissions decrease significantly.

SUSSANE RYBERG said that Ceria is certainly a challenging system, and further studies are necessary. Pt/ceria catalysts exhibit high activity for CO oxidation at low temperature. Carbon-containing adsorbents on ceria are mainly released as CO_2. It takes very long time to saturate the ceria support with carbonates. The storage of carbon-containing adsorbate show different behaviour depending on if CO or CO_2 is supplied.

ASIMA SULTHANA AND MASAAKI HANEEDA proposed that performance of IR/SiO_2 plays an important role in reducing the emissions of nitrogen oxide and carbon monoxide, but the catalyst is gradually deactivated due to the oxidation of Ir metal spices on the catalyst. About 45% of NOX was reduced using this.

3.0 METHODS

3.1 Fabrication: After degreasing, metallic surface contaminants such as iron embedded in fabrication shop forming and handling, weld splatter, heat tint, inclusions and other metallic particles must be removed in order to restore the inherent corrosion resistance of the stainless steel surface.Nitric-HF pickling, (10% HNO_3, 2% HF at 49^0C to 60^0C (120 to 140F), is the most widely used and effective method removing metallic surface contamination. Pickling may be done by immersion or locally using a pickling paste.


Fig 3.1 : Normal TIG welding Fig 3.2: Fabrication material of smoke filter

3.2 Glass Bead or Walnut shell blasting : Glass bead or walnut shell blasting are very effective in removing metallic surface contamination without damaging the surface. It is sometimes necessary to resort to blasting with clean sand to restore heavily contaminated surfaces such as tank bottoms, but care must be taken to be certain the sand is truly clean, is not recycled and does not roughen the surface. Steel shot blasting should not be used as it will contaminate the stainless steel with an iron deposit.

4.0 Experimental setup:


Fig 4.1: Experimental setup Fig 4.2 : Smoke meter

5.0 Results and discussions

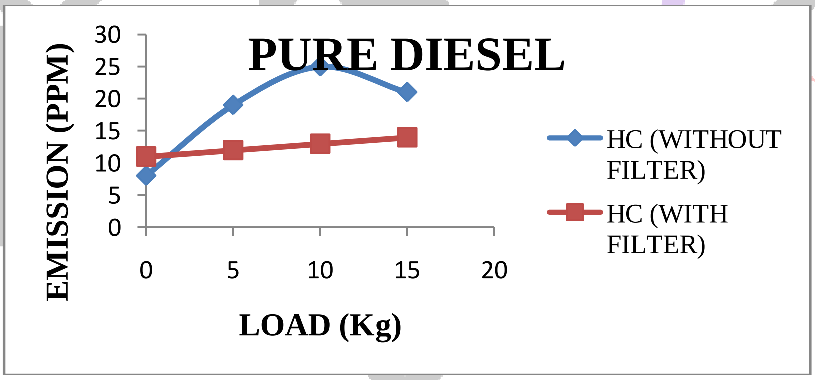

Fig 5.1: Comparision of HC emissions with Load

A graph is plotted between load and emissions taking load on x-axis and hydro carbon emissions on y-axis. From the graph it is observed that HC emissions for a pure diesel are more without filter and when the filter is being added emissions were reduced, as the fuel is being burned completely when compared with diesel in without filter conditions.

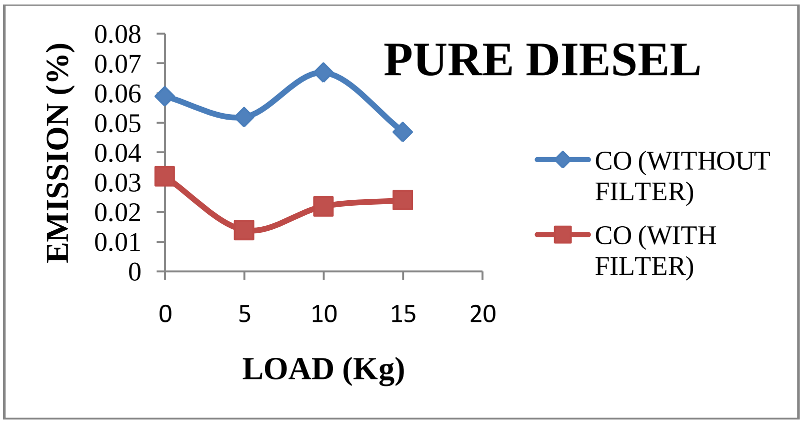

Fig 5.2: Comparision of CO emissions with Load

A graph is plotted between load and emissions taking load on x-axis and carbon monoxide emissions on y-axis. From the graph it is observed that CO emissions for a pure diesel are more without filter and when the filter is being added emissions were reduced to a greater extent, as the catalyst absorbs CO and releases O_2

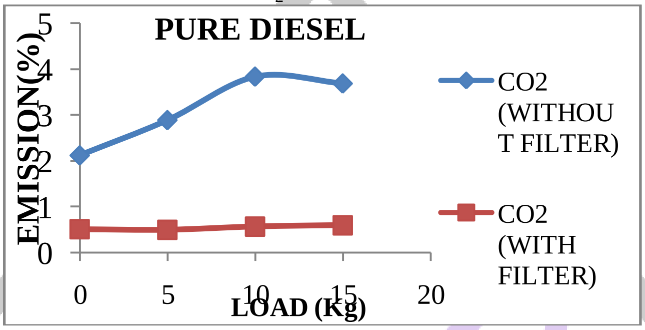

Fig 5.3: Comparision of CO2 emissions with Load

A graph is plotted between load and emissions taking load on x-axis and carbon dioxide emissions on y-axis.it is observed that the CO_2 is being reduced when compared with the diesel without filter conditions. But it increases with increase of load with filter conditions, as in the conversion of hydrocarbons and carbon monoxide these carbon dioxide is formed.

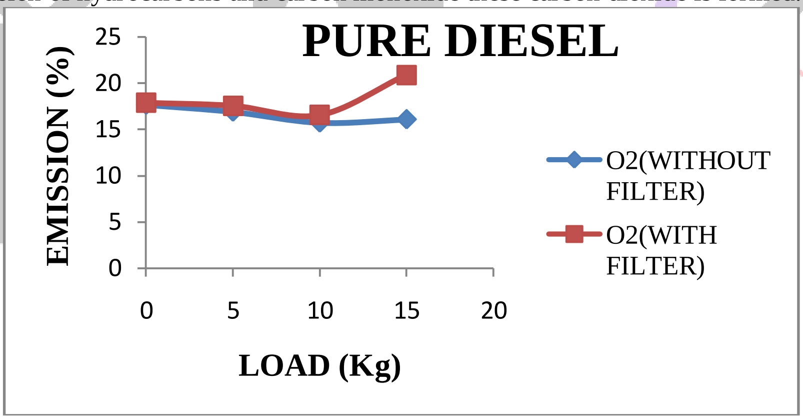

Fig 5.4: Comparision of O2 emissions with Load

A graph is plotted between load and emissions taking load on x-axis and oxygen emissions on y-axis.as load increases oxygen content is decreasing, as the catalyst oxidises carbon content, percentage of oxygen is reduced.

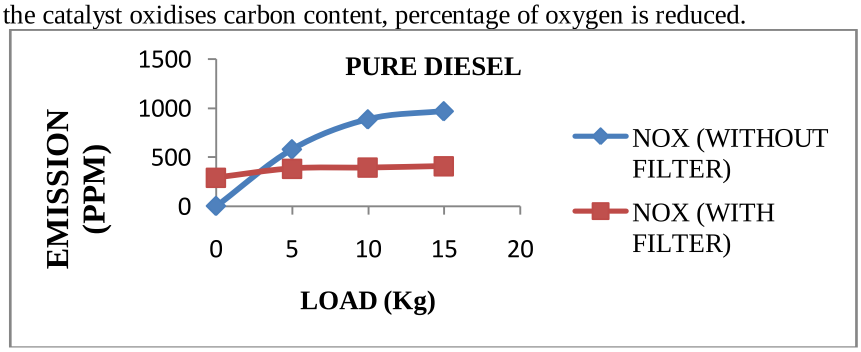

Fig 5.5: Comparision of NOx emissions with Load

A graph is plotted between load and emissions taking load on x-axis and NO_x emissions on y-axis. As we observe from the graph NOx is being decreased to a greater extent when compared with the diesel in without filter conditions.

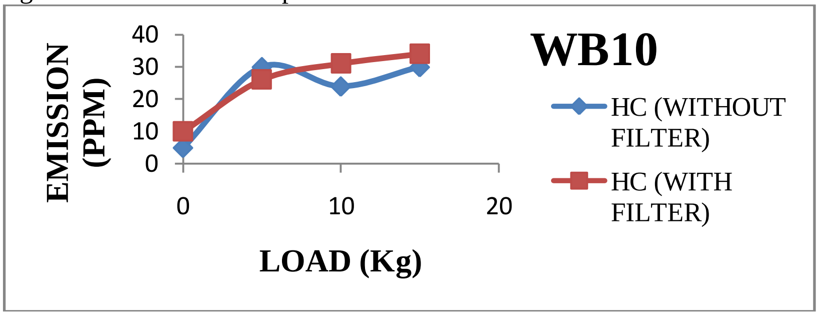

Fig 5.6: Comparision of HC Emissions of WB10 with Load

From the graph it is observed that HC emissions increases with increase of load in with filter condition, as the fuel is incompletely burnt and complete combustion doesn't occurs.

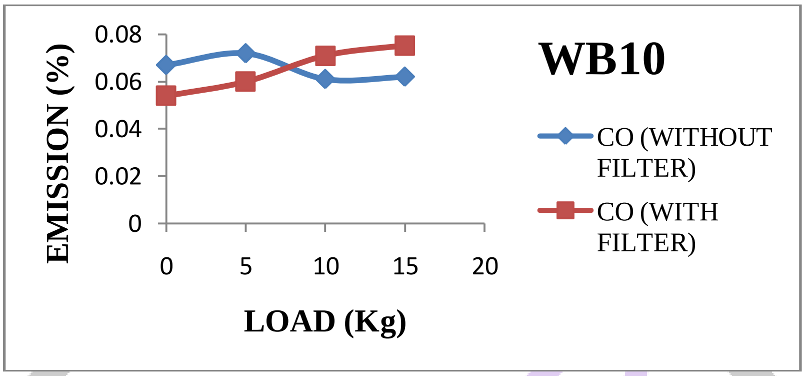

Fig 5.7: Comparision of CO Emissions of WB10 with Load

From the graph it is observed that the CO emissions were being increased with attachment of the filter, as the catalyst is being reduced and more amount of CO emissions were released.

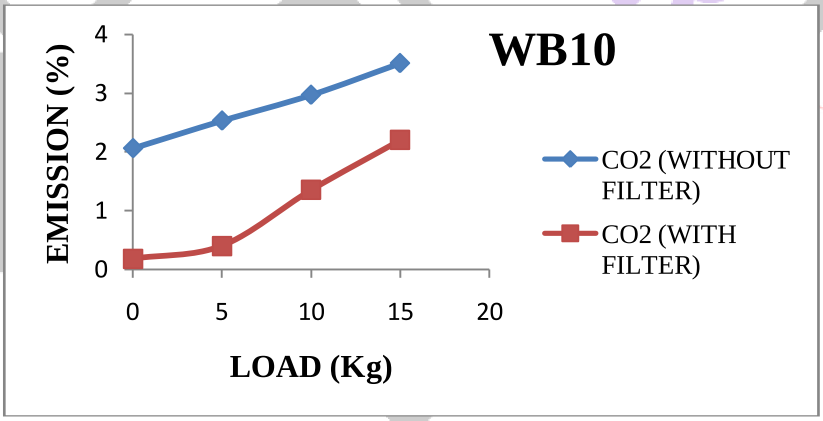

Fig 5.8: Comparision of CO2 Emissions of WB10 with Load

From the graph it is observed that CO_2 emissions were being reduced when compared to bio diesel in without filter condition, but with filter it keeps on increasing, this is because, as in conversion of HC &CO emissions Carbon dioxide was formed.

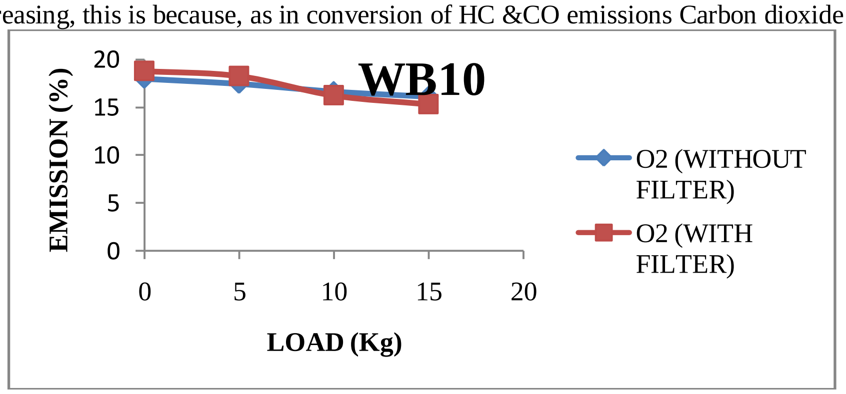

Fig 5.9: Comparision of O2 Emissions of WB10 with Load

From the graph it is observed that O_2 emissions were increased in initial load conditions and were being reduced as load increases. As the catalyst oxidises carbon content, percentage of oxygen is reduced.

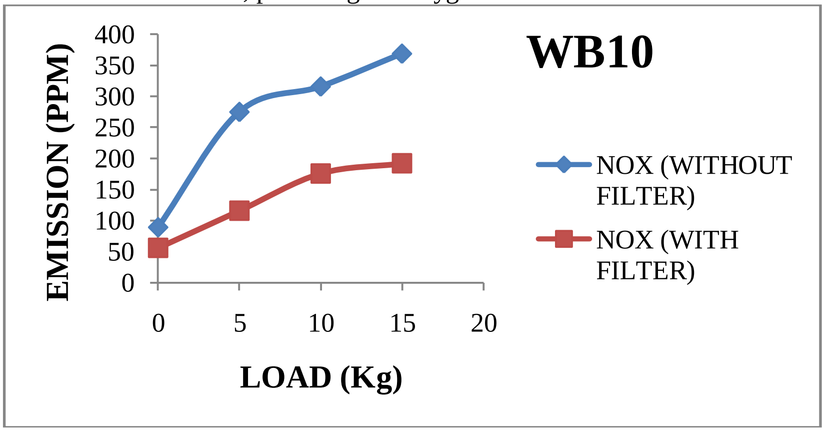

Fig 5.10: Comparision of NOx Emissions ofb WB10 with Load

A graph is plotted taking load on x-axis and NO_X emission percentage on y-axis. Emissions of NO_X were reduced to a greater extent when compared with the bio diesel in without filter conditions.

CONCLUSION:

1. CO emissions are reduced using this converter.
2. All the remaining emission like (HC, NO_X, and CO2) was decreased to a greater extent but increasing at maximum load.
3. As we use metallic filter as catalyst, it absorbs most of the CO content and releases more oxygen.
4. As the converter is made of steel which has a property of absorbing heat and helps the converter to maintain a optimum temperature which can easily be started even in cold conditions.

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