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Carbon Exhaust Filter

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ABSTRACT

In India, there are 210 million registered vehicles as of 31st March 2015. Most of these do not come with the emission standard of Bharat Stage IV for vehicles which was adopted in 2005 by Indian Government. The emissions from these vehicles are toxic and contain harmful gases which causes Air pollution. Air pollution is responsible for many health problems in urban areas.

Keywords: Exhaust Carbon Filter, Charcoal Filtering, Chemical Adsorption

I. INTRODUCTION

Carbon filtering is a method of filtering that uses a bed of activated carbon to remove contaminants and impurities, using chemical absorption. Each particle/granule of carbon provides a large surface area/pore structure, allowing contaminants the maximum possible exposure to the active sites within the filter media. One pound (450 g) of activated carbon contains a surface area of approximately 100 acres (40 Hectares). Activated carbon works via a process called adsorption, whereby pollutant molecules in the fluid to be treated are trapped inside the pore structure of the carbon substrate.

Carbon filtering is commonly used for water purification, in air purifiers and industrial gas processing, for example the removal of siloxanes and hydrogen sulphide from biogas. It is also used in a number of other applications, including respirator masks, the purification of sugarcane and in the recovery of precious metals, especially gold. It is also used in cigarette filters. Active charcoal carbon filters are most effective at removing chlorine, sediment, volatile organic compounds (VOCs), taste and odour from water. They are not effective at removing minerals, salts, and dissolved inorganic compounds. Typical particle sizes that can be removed by carbon filters range from 0.5 to 50 micrometres. The

particle size will be used as part of the filter description. The efficacy of a carbon filter is also based upon the flow rate regulation. When the water is allowed to flow through the filter at a slower rate, the contaminants are exposed to the filter media for a longer amount of time.

Aim to Reduce CO2

The present Aim is to deal with the toxic and harmful gases emitted from the automobiles. Carbon dioxide emission is the common type of gas emitted from the burning of fossil fuels in automobiles. When this CO2 is released into the atmosphere it remains there until it is absorbed in some form. we have presented a dynamic work effort to reduce CO2 emissions through Carbon capture and storage mechanisms. Adsorption technique is followed to control the Carbon emissions from the exhaust gas. The solid adsorbent used in this work is zeolite, were it locks and holds the carbon molecules from the exhaust. The carbon capture tail pipe is successively designed for automotive emission

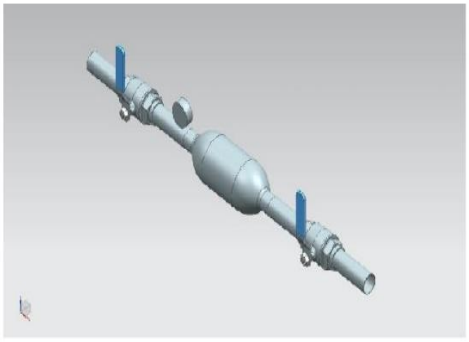
control. It is the first action taken from automobile sector for controlling CO2 emission from the automobile exhaust.

II. METHODOLOGY

The exhaust gas is allowed to pass into the inlet of the tailpipe. Pressure gets reduced and velocity of the gas increases because of the conical section. The flowing exhaust gas is free to move in all directions inside the tailpipe. As the movement of exhaust gas is not abruptly obstructed anywhere in its path, the back pressure is limited to minimum level. The flowing gas passes over the trap which is fixed at the inner of the tailpipe. Gas entering the perforated sheet mesh holes gets exposure to the zeolite pellets. The exposure of the exhaust gas is maximum by increased in size of the pellets. Zeolite pellets are highly porous and consistent matrix of zeolite that provides the adsorption of impurities.

The exhaust gas containing CO2and other particles are adsorbed by the zeolite pellets. Adsorptions takes place by locking of gaseous CO2 molecules over the porous layer of the zeolite. Adsorption quantity of CO2 depends on the type of zeolite used. Maximum adsorption limit of zeolite depends on the amount of exhaust produced from the engine. The material for sheet mesh is considered as steel which has high thermal properties. Sheet mesh also has filtration efficiency which will also filters the black carbon particles up to certain extent. As this is the first device to be designed to reduce CO2 emission. Its limitations will be considered. The Carbon emission levels will be reduced to maximum by implementing this device on the exhaust manifold.

CO2 gas adsorbed in the zeolite mesh can be removed by treating mesh with 5 molar H2SO4. Since Silicon is chemically inert and aluminum passivates, aluminum acts as insulator.



Thus in an acid media SO42-ion of H2SO4 acts as catalyst and thereby CO2 gas gets desorb and it combines with H+ ions of acid to form methane(CH4) and water(H2O).Methane can be collected in separate container and can be used as a fuel while water as solvent. The chemical reaction is given below:

$$CO2 + 4H2 \text{ ----> } CH4 + 2H2O$$

Since is focused on the process to adsorb the CO2 gas many limitations has been considered on design and material selection part. In the future advance study can be done for the proper selection of the tail pipe material and its weight consideration so that it can be easily fitted to the vehicle exhaust manifold. This technique can also be used in the factory chimney by applying layer of zeolite around the surface wall of chimney or designing the chimney on the same basic principle, however its lifespan should be considered.

III. CONCLUSION

In this analysis it has been presented a dynamic work effort to reduce CO2 emissions from the exhaust manifold using adsorption technique through tail pipe. It's been found that there is approx. 28-50% reduction in CO2 gas emission using the tail pipe. 2500ppm to 1300 ppm and the result are satisfactory. Also pressure gauge was also installed to measure back pressure

which is very low and hence doesn't affect the engine performance. It is the first action taken from automobile sector for controlling CO2 emission from the automobile exhaust.

IV. REFERENCES

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