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Modification & Experimental Analysis of Motorcycle Exhaust System with Use of Exhaust Emission Reducer Material

Mayur Jalanapurkar[1], Arpit Panchal[2], Ashish Jain[3], Vishwas Patel[4]

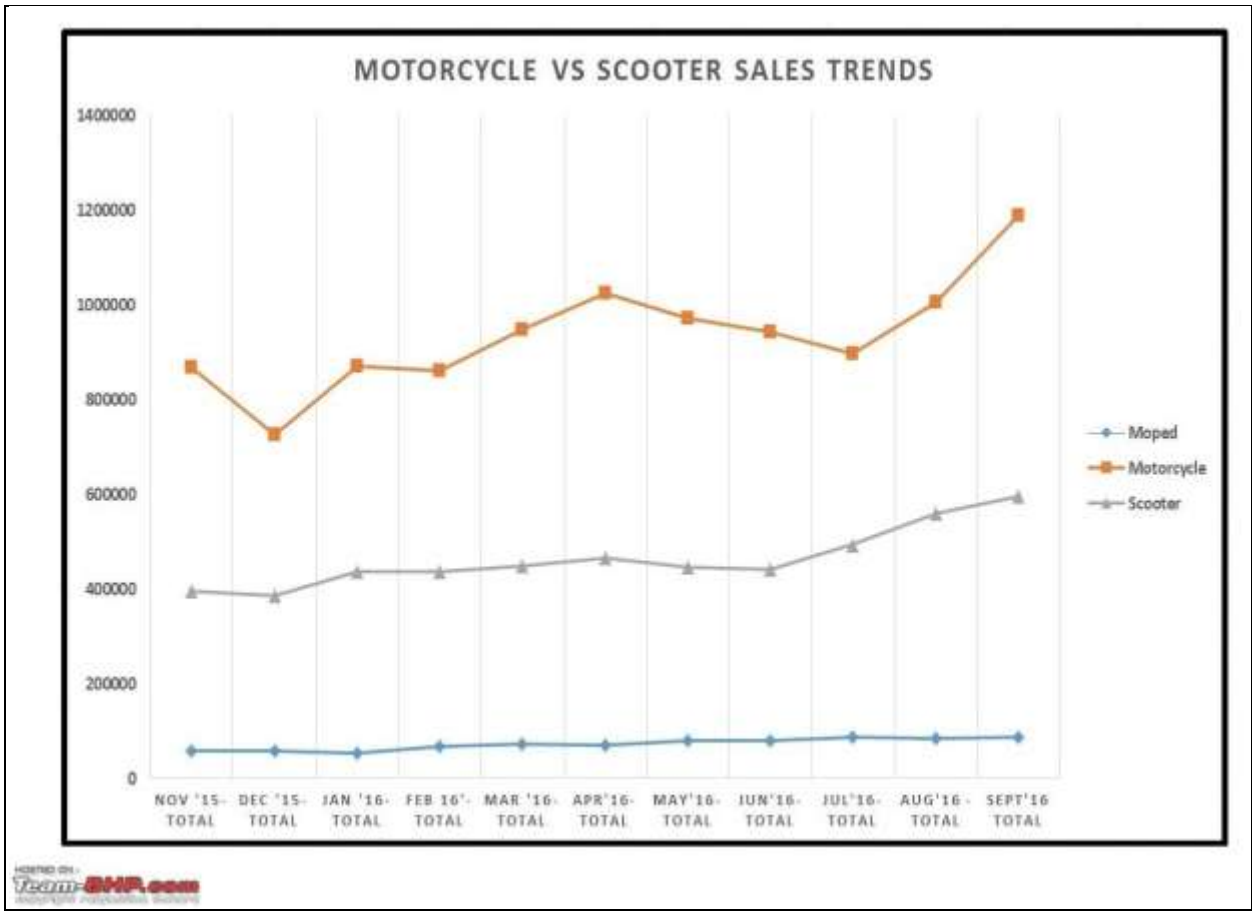
[1,2,3,4]Automobile Dept. GIDC Degree Engg. College

Abstract – *Day by day, increasing the demands of vehicles increases the pollution in environment. Mainly four wheelers and two wheelers are much of them. So it is necessary to think about reduce the pollution from vehicles. Here we focused on motorcycle exhaust system which contains catalytic convertor in exhaust system. The Exhaust pollutants like (CO, HC & CO_2) are produces from the motorcycle. The materials used in exhaust system are generally platinum, Rhodium, & Palladium which converts harmful gas to harm less gas. In this experiment first we took a reading with normal silencer means no modification done. Then we took readings using different materials like Aluminum Oxide (Al_2O_3), Silicon Carbide (SiC), Aluminum Nitride (AlN) and combination of these materials. Analyzing and comparing all readings, we observed that silicon carbide & its combination with Aluminum oxide reduces the CO, HC & CO_2.*

Keywords- *Exhaust emission, automobiles, pollution, exhaust reducer material, Experiment*

I. INTRODUCTION

Now a day's, requirements of automobiles reach much higher. This increases the pollution in the environment and produces harmful gases like CO, HC & CO_2. Among the automobiles motor cycles are most demand for all categories of people. So consumption of petrol is more & also creation of exhaust gases more. So we have to do effort toward reduces this pollution. For this, we choose the some materials like Aluminum Oxide (Al_2O_3), Silicon Carbide (SiC), and Aluminum Nitride (AlN) to reduce the exhaust gases from motorcycle. Properties of these materials are shown below table.



Graph -1 Motorcycles sale

Table 1: Properties of Material

Properties	Unit	Aluminum Oxide	Silicon Carbide	Aluminum Nitride
Density	gm/cc	3.89	3.1	3.26
Porosity	%	0	0	0
Color		ivory	black	gray
Flexural Strength	MPa	379	550	320
Bulk Modulus	GPa	228	-	-
Compressive Strength	MPa	2600	3900	2100
Hardness	Kg/mm^2	1440	2800	1100
Maximum Use Temperature (no load)	°C	1750	1650	-
Thermal Conductivity	W/m°K	35	120	140-180
Specific Heat	J/Kg•°K	880	750	740

II. METHODOLOGY & EXPERIMENTAL WORK

In this work, we used a motorcycle for an experiment. First we set up our experiment with exhaust gas analyzer. For that motorcycle silencer connected to exhaust gas analyzer probe. First we performed experiment with normal silencer means no added other material. Then we performed experiment with different materials like Aluminum Oxide (Al_2O_3), Silicon Carbide (SiC), and Aluminum Nitride (AlN) one by one & also combination of these material. For that we modify the silencer by two partition means three part in silencer. We used materials in grams (100, 200 gm etc.) we performed around seven different experiment & noted the result of these experiment.

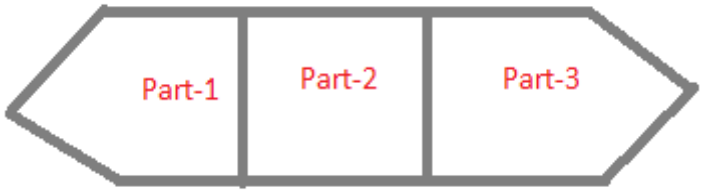


Figure 1: Line diagram of Silencer with two partitions

Table 2 Experimental table

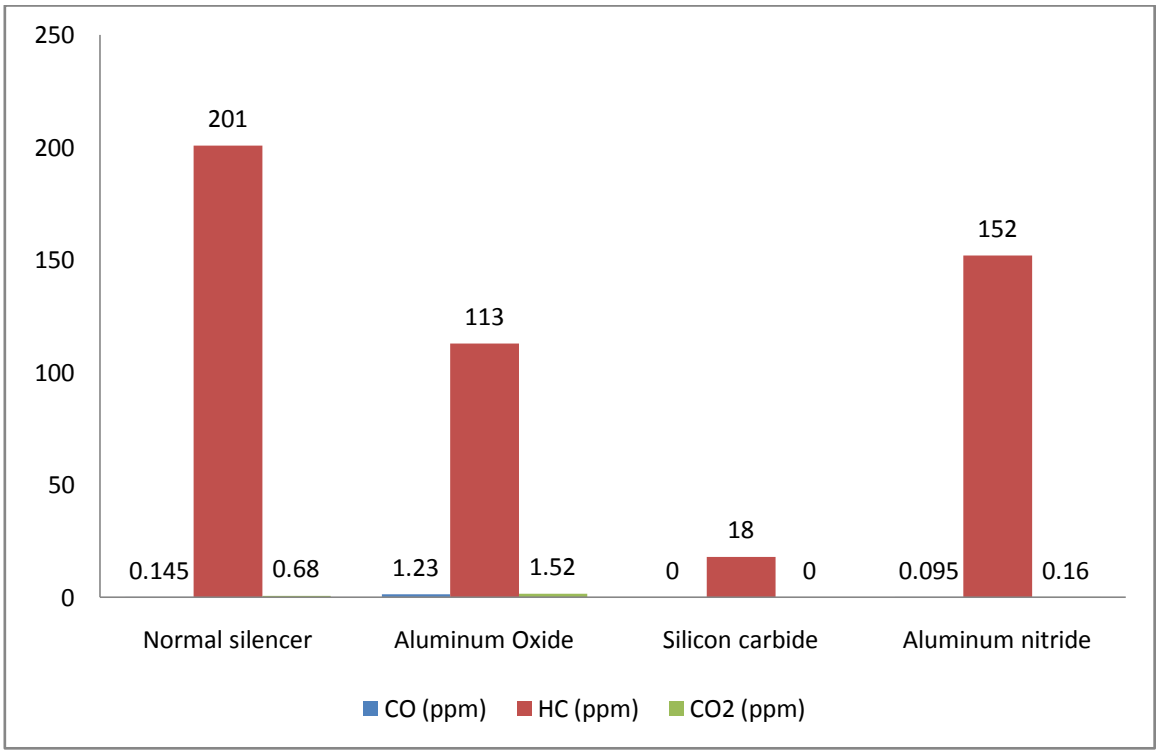
Experiment no.	Material	Weight (gm)
1	No added other material (normal silencer)	-
2	Aluminum Oxide (Al_2O_3)	200
3	Silicon Carbide (SiC)	200
4	Aluminum Nitride (AlN)	200
5	Aluminum Oxide (Al_2O_3) & Silicon Carbide (SiC)	100 +100
6	Aluminum Oxide (Al_2O_3) & Aluminum Nitride (AlN)	100 +100
7	Aluminum Oxide (Al_2O_3) ,Aluminum Nitride (AlN) & Silicon Carbide (SiC)	100 +100 +100

III. RESULT ANALYSIS

After performing the experiment following reading we noted...

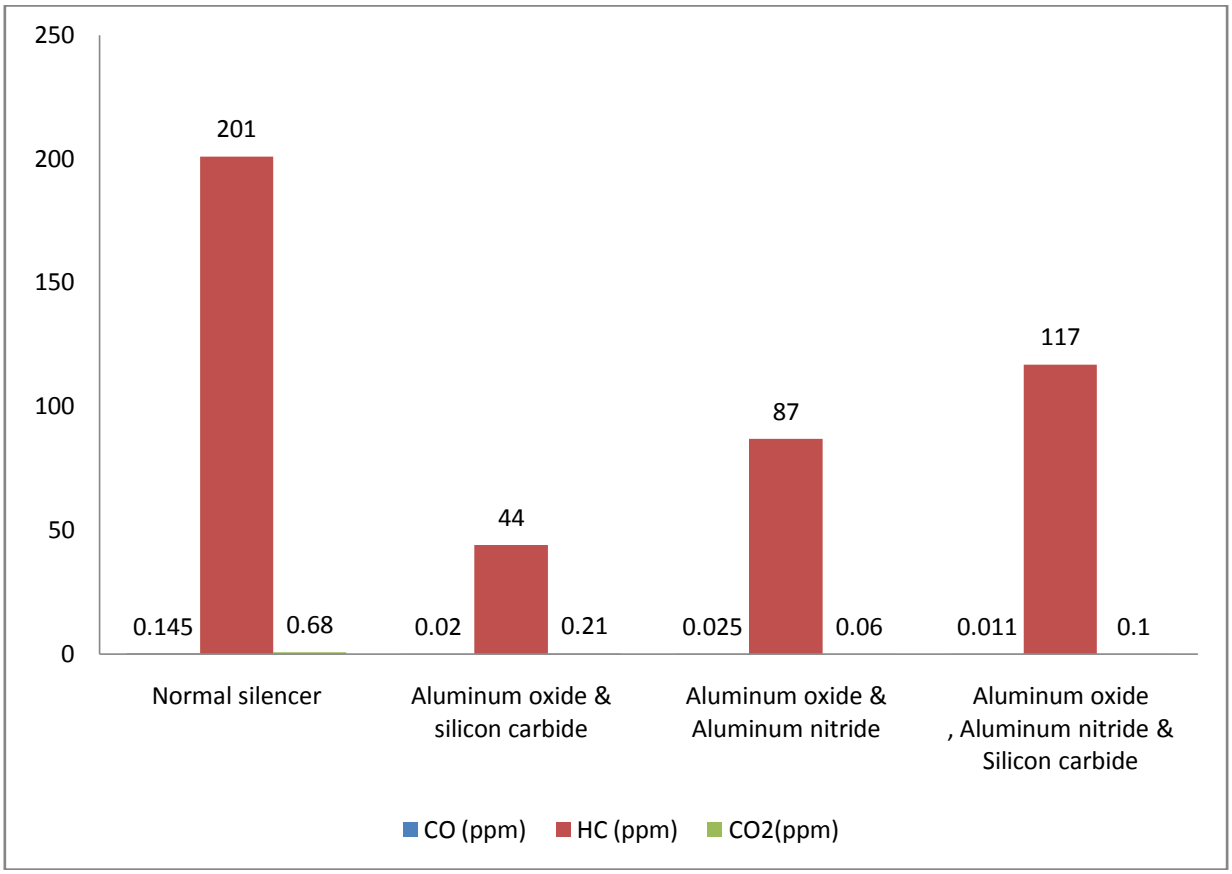
Table 3 Observation table

Experiment no.	Material	Weight (gm)	CO (ppm)	HC (ppm)	CO_2 (ppm)
1	No added other material (normal silencer)	-	0.145	201	0.68
2	Aluminum Oxide (Al_2O_3)	200	1.230	113	1.52
3	Silicon Carbide (SiC)	200	-	18	-
4	Aluminum Nitride (AlN)	200	0.095	152	0.16
5	Aluminum Oxide (Al_2O_3) & Silicon Carbide (SiC)	100 +100	0.020	44	0.21
6	Aluminum Oxide (Al_2O_3) & Aluminum Nitride (AlN)	100 +100	0.025	87	0.06
7	Aluminum Oxide (Al_2O_3) ,Aluminum Nitride (AlN) & Silicon Carbide (SiC)	100 +100 +100	0.011	117	0.10



Graph-2 Comparison between normal silencer & different materials (All values are in ppm)

As per above graph, it is shown that, HC emission is more in normal silencer than the other three materials. Silicon carbide has a lowest emission of HC than the aluminum oxide & aluminum nitride. But CO & CO2 are slightly increases in aluminum oxide & aluminum nitride compare to normal silencer.



Graph- 3 Comparison between normal silencer & different combination of materials (All values are in ppm)

Here as per shown above graph, HC emission is lower in combination of aluminum oxide & silicon carbide. But HC slightly increases in combination of aluminum oxide & aluminum nitride and combination of aluminum oxide, aluminum nitride & silicon carbide. Emission of CO & CO_2 are lower in combination of the materials than the normal silencer.

IV. CONCLUSION

From the above table & graph it is noted that silicon carbide has a very low emission. Also combination of silicon carbide & Aluminum oxide gives low CO & CO_2 emission. Combination of Aluminum oxide & Aluminum nitride also gives lower emission comparing all three material combinations.

V. REFERENCES

1. Wang Yinhui et al "The impact of fuel compositions on the particulate emissions of direct injection gasoline engine" ELSEVIER Fuel 166 pp. 543-552 Science Direct, November2015
2. M. Bogarra et al "Study of particulate matter and gaseous emissions in gasoline direct injection engine using on-board exhaust gas fuel reforming" ELSEVIER Applied energy 180(2016) pp. 245-255 Science Direct, July 2016
3. Qu Dawei et al "Research on particulate filter simulation and regeneration control strategy" ELSEVIER Mechanical system & signal processing Science Direct, May 2016
4. B. Opitz et al "A simulation study on the conversion efficiency of catalytically active particulate filters" ELSEVIER Chemical engg. Science 149 (2016) pp. 117-128 Science Direct, April 2016
5. Anthi Liati et al "Electron microscopic characterization of soot particulate matter emitted by modern direct injection gasoline engines" ELSEVIER combustion & flame 166(2016) pp. 307-315 Science Direct, January 2016
6. W.Y. Hernández et al "La/Sr-based perovskites as soot oxidation catalysts for Gasoline Particulate Filters" ELSEVIER catalysis today (2015) Science Direct, December 2014

