

# International Journal of Innovative Research in Science, Engineering and Technology

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## Emission Control in IC Engine Using Zeolite and Achieve Uniform Flow Distribution with Less Pressure Drop Using Diffuser in Catalytic Converter

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**ABSTRACT:** Many research has been taken place in different techniques for lessening emission. So we have additionally made a move to decrease harmful emission from vehicles by changing of exhaust system and making another way of placing diffuser plate inside the catalytic converter. So that, the pressure drops and velocity increases inside the catalytic converter and the exhaust gas [NoX&Hc] passes by mesh. Where CO with zeolite coating has done. This process reduce the ratio of harmful gases getting exhaust.

**KEYWORDS:** Flow analysis, Emission, Zeolite.

### I. INTRODUCTION

An exhaust device is an emanations control tool that proselytes deadly gasses and pollutants in fumes fuel to a fantastic deal heaps much muchless poisonous contaminations via catalyzing a redox response (an oxidation and exhaust systems are carried out with inward ignition engines fueled through the use of each petroleum (gas) or diesel—collectively with lean- eat vehicles and lamp oil radiators and stoves. "Two-manner" converters consolidated oxygen with carbon monoxide (CO) and unburned hydrocarbons (HC) to create carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O). This is because of the fact three-manner-converters require each rich or stoichiometric burning to efficaciously reduce NO<sub>x</sub>. Albeit exhaust structures are most customarily related to fumes frameworks in autos, they are likewise carried out on electric generators, forklifts, mining hardware, trucks, transports, trains and cruisers. They are likewise applied on some timber stoves to govern emanations. This is generally because of government control, each through direct natural manipulate or through fitness and protection directions. We have made a way on lowering the fee of catalytic converter and making it more powerful as we realise that catalytic converter that it absorbs gasses and

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decreases gasses to a whole lot much less unstable gasses and release them to surroundings however we strive to lessen the emission and developing its efficiency.

## 1.1 Catalytic converter

A catalytic converter is an exhaust emission control device that converts poisonous gases and pollutants in exhaust gasoline from an inner combustion engine into less-toxic pollutants by manner of catalyzing a inner combustion engines fuelled by means of either gas or diesel, along side lean-burn engines similarly to kerosene warmers and stoves. Although catalytic converters are most generally applied to exhaust systems in automobiles, they're appreciably utilized on electrical generators, forklifts, mining equipment, trucks, buses, locomotives, and motorcycles. They also are used on some wood stoves to control emissions. This is generally in reaction to government law, either via direct environmental law or thru health and safety regulations.

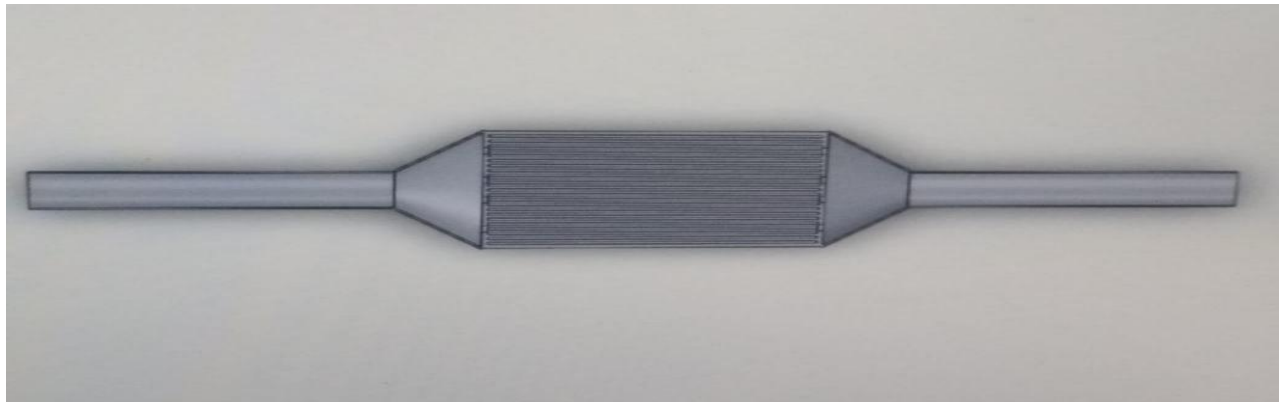


Fig.1 catalytic convertor

## II. COMPONENTS AND DISCRPTION

### 2.1 Diffuser Plate

A diffuser is a 3mm plate that has a 10 holes at a diameter of 13mm. The plate controls the high pressurized harmful toxic gases that's come from IC engine that is used to reduce a pressure and then increase a velocity. It also distributes a controlled toxic gases to spread over the mesh.

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Fig:2 Diffuser Plate

## 2.2 Mesh

A mesh is a barrier product of related strands of metal, fiber, or other flexible or ductile materials. A mesh is similar to an internet or a internet in that it has many related or woven strand.



Fig:3 Mesh

## III. EXPERIMENTAL PROCEDURE

In our define of exhaust device we've got applied a mattress of silica gel and earth as nano molecule protecting in adsorbing material just earlier than the lessening and oxidation mind the end intention to lower the heap on exhaust gadget and to construct its efficiency. We have likewise transformed it cloth as we comprehend that exhaust gadget are made from platinum and palladium. Rhodium goes about as a decrease operator and it reduce NO outflow. Be that because it may, here we can make

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use of PEROVSKITE OXIDE as an impetus in We can likewise employ immoderate Aluminum content material zeolite to adsorb carbon. In our plan we've got moreover placed a mattress of silica gel or dirt to additionally increment and it's going to absorb carbon higher and could make situation all the These are applied to lower HC into carbon dioxide and water.our converter because it builds its productivity and it has higher redox properties.

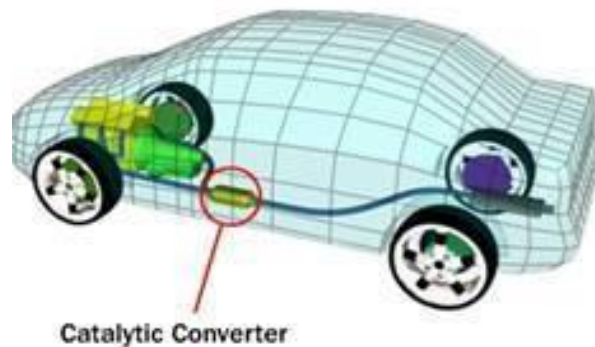


Fig:4 position of catalytic convertor

## IV. WORKING PRINCIPLE

Catalytic converters were used in automobile emission manipulate structures within the United States and Canada; many extraordinary international places have also accompanied stringent car emission regulations that in effect require the good deal and oxidation catalysts are typically contained in a commonplace housing; however, in a few instances, they may be housed separately. reactions rise up most successfully at the identical time as the catalytic converter gets exhaust from an engine walking barely above the stoichiometric point. For gas combustion, this ratio is among 14.6 and 14.8 additives air to at least one part fuel, with the aid of weight.



Fig:5 catalytic convertor

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In general, engines geared up with three-way catalytic converters are geared up with a computerized closed-loop feedback fuel injection system using one or greater oxygen sensors.

Three-manner converters are effective at the same time because the engine is operated internal a slim band of air-gasoline ratios near the stoichiometric point, such that the exhaust gas compositionConversion overall performance falls very abruptly whilst the engine is operated outside of this band.



Fig:6 Zeolite coted mesh

Oxidation of unburnt hydrocarbons (HC) to carbon dioxide and water, similarly to the above NO reaction. Under lean engine operation, the exhaust carries more oxygen, and the cut price of NO<sub>x</sub> is no longer favored. Under wealthy conditions, the extra fuel consumes all of the available oxygen previous to the catalyst, leaving fine oxygen saved inside the catalyst available for the oxidation function. Closed-loop engine control systems are crucial for effective operation of 3-manner catalytic converters because of the non-save you balancing required for effective NO<sub>x</sub>reduction and HC oxidation. The manipulate tool must prevent the NO<sub>x</sub> reduction catalyst from becoming definitely oxidized, yet refill the oxygen garage fabric sincerely so its characteristic as an oxidation catalyst is maintained. Three-manner catalytic converters can save oxygen from the exhaust fuel stream, generally while the air-fuel ratio is going lean.

## V. CONCLUSION

This turned into concluded that the emission was controlled by the usage of of a catalytic converter. In this glaringly zeolite can take in gasses like nitrogen, carbon, hydrogen, sulphur at an impressive rate and that too extraordinarily effectively. Zeolite while consolidated applied at our exhaust gadget can fundamentally diminish the infection, because it were, and that too at a less high priced charge and mild price. Our essential idea is to decrease the price of exhaust device and to extend its productiveness and to influence circumstance to loose from contamination and to make things shabby for needy individuals.

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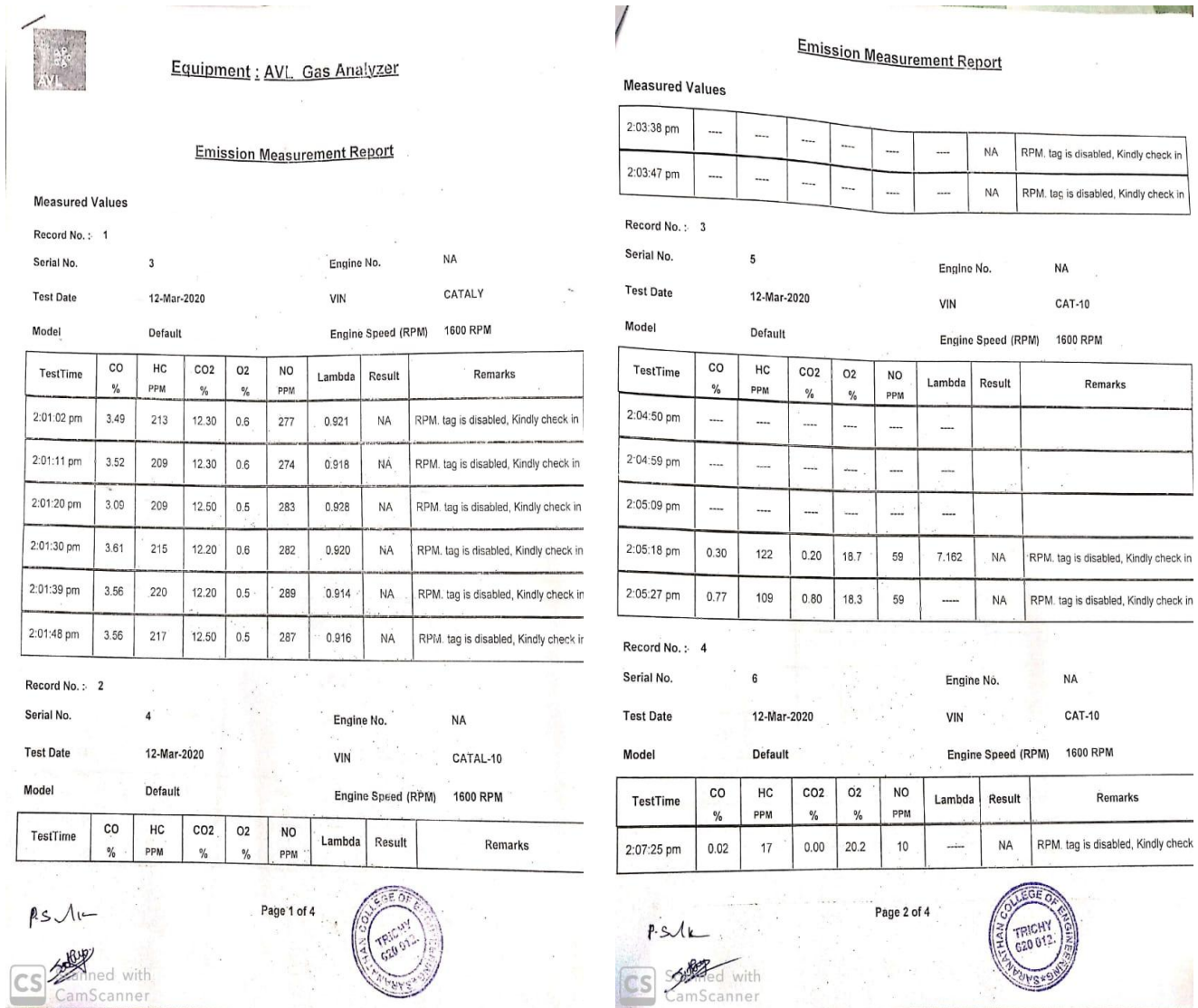


Fig.6,7 Without Catalytic Converter and 10 kg load

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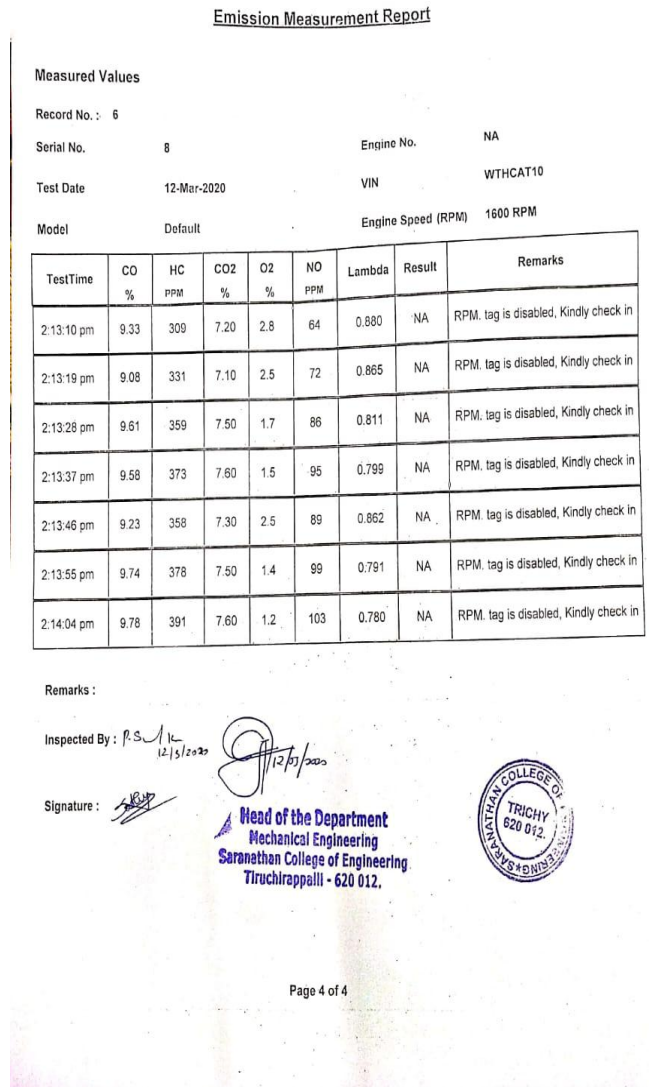
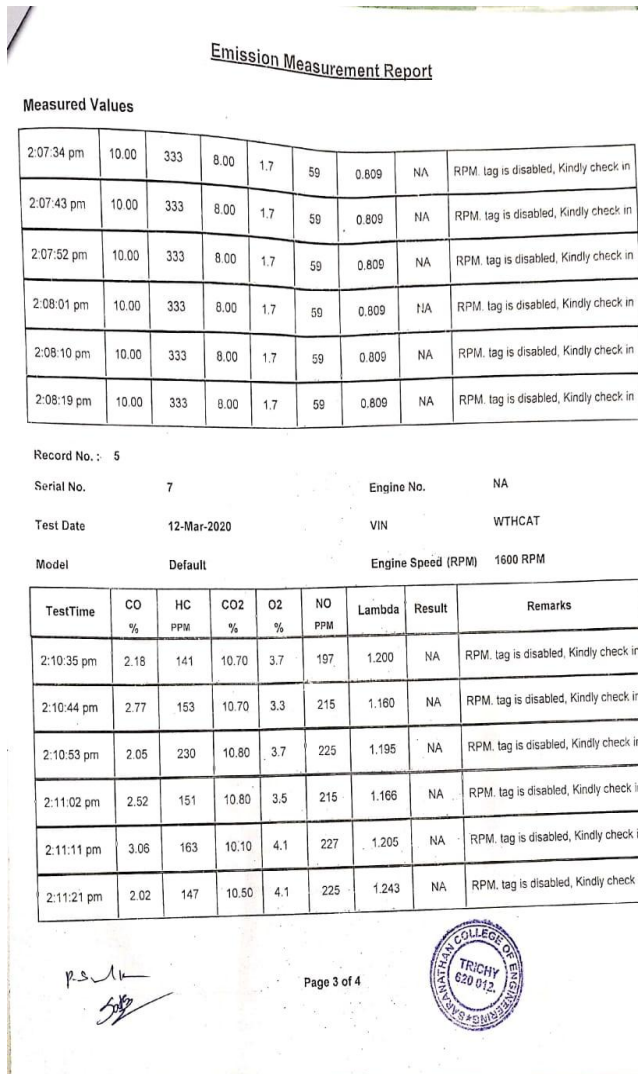


Fig. 8, 9 With Catalytic Converter and 10 kg load

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## REFERENCES

- [1] Rory John Clarkson. A Theoretical and Experimental Study Of Automotive Catalytic Converters(1995)
- [2] Herman Weltens, HaraldBressler, Frank. Optimization of Catalytic Converter Gas Flow Distribution by CFD Prediction(1993)
- [3] M.C.LAI, T.LEE, J.Y. KIM. Numerical and Experimental Characterizations Of Automotive Catalytic Converter Internal Flows(1991)
- [4] NurulAmiraZainal, EzzatulFarhainAzmi and MohdArifinSamad. Effect of inlet cone pipe angle in catalytic converter(2017)
- [5] Cornejo, P. Nikrityuk& R. E. Hayes. Turbulence Decay inside the Channels of an Automotive Catalytic Converter Monolith(2017)
- [6] Nagalli Raghu, G.V.Devra, Jai Sagar. Experimental Analysis on Catalytic Converter Using CFD(2015)
- [7] HeshamA. Ibrahim, SherifAbdol, and Wael H. Ahmed. Understanding Flow throughCatalytic Converters(2000)
- [8] R.Senthil. Design, Analysis Of Flow characteristics Of Catalytic Converter And Effects Of Backpressure On Engine Performance(2013)
- [9] ThangarajSelvam, FranziskaWarmuth, Michael Klumpp. Fabrication and pressure drop behavior of novel monolithic structures with zeolitic architectures (2015)
- [10] Cornejo, P. Nikrityuk& R. E. Hayes. Turbulence Decay inside the Channels of an Automotive Catalytic Converter Monolith(2018)