

# Emission Reduction of Two Stroke Petrol Engine By Using Catalytic Converter

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**Abstract-** Air pollution is becoming very serious problem in today's situation. The significant environmental implications of vehicles cannot be avoided. The need to reduce vehicle pollution has led to emission control. In this paper attempt has been made to understand the air pollution problem due to two-stroke engines, which is major cause of main diseases like cancer, heart disease, etc. especially in urban area. If we compare two stroke engine with four stroke engine, two stroke engine has more engine emission level than four stroke engine. Engine emissions can be controlled either by primary or secondary methods. Primary methods focus on the process on emission formation and involve e.g. adjustment of the engine injection equipment, injection and exhaust valve timing, as well as technologies such e.g. Water-In-Fuel emulsion (WIF) and exhaust gas recirculation (EGR). Secondary methods focus on exhaust gas after treatment and involve for instance NO<sub>x</sub> reduction using selective catalytic reduction (SCR) and scrubber technology for washing out sulfur species as well as particulate matter. In this work we used the catalytic converter on two stroke engine to reduce emission level. Before using this catalytic converter PUC test is conducted and simultaneously the same test is conducted after using the same. The effect of using catalytic converter can be seen in second test.

**Keywords-** Catalytic Converter, Engine Emission, Two Stroke petrol engine.

## I. INTRODUCTION

Air pollution is increasing in many parts of the world. The share of two-stroke engine vehicles to vehicular emissions of particulate matter (PM), HC and CO is calculated at 29%, 73% and 42% respectively (Environmental Pollution (Prevention and Control) Authority for National Capital Region 1999). Emissions from large and rapidly growing number of two and three wheeled vehicles are a major source of air pollution in a number of countries, especially in Asia. Two-wheel vehicles, which include mopeds, scooters, and

motorcycles, are used mostly for personal transportation, although in some cities, they are used as taxis. Three-wheel vehicles, which include small taxis such as auto rickshaws and larger vehicles that hold as many as a dozen passengers, are used commercially. Conventional two-stroke engines have several advantages over four-stroke engines. These include lower cost, excellent power, mechanical simplicity (fewer moving parts and resulting ease of maintenance), lighter and smaller engines, etc.)

Emissions are by-products of the combustion, which mainly contain obnoxious gases and unburnt hydrocarbons. They constitute a hazard to the health and are expensive, because of having unburnt hydrocarbons, i.e. unutilized energy. Carbon monoxide is toxic to humans and animals. The combination of unburnt hydrocarbons and nitrogen oxides, particularly in sunlight, produces visible smog, which is harmful to lungs and eyes. The nitrogen oxides are said to contribute to the depletion of the ozone layer in the upper atmosphere, which potentially alters the absorption characteristics of ultraviolet light in the atmosphere and increases radiation hazard on the earth surface. A fresh, considerably more stringent set of norms are laid down for the year 2000 as shown in Table 1

Table 1: Emission norms for two and three-wheelers.

Two-Wheelers in g/km			
Year	CO	HC	HC + NO <sub>x</sub>
1991	12 - 30	8 - 12	----
1996	4.50	----	3.60
2000	2.00	----	1.50
2005(BS II)	1.50	----	2.00
Three-Wheelers in g/km			
Year	CO	HC	HC + NO <sub>x</sub>
1991	12 - 30	8 - 12	---
1996	6.75	----	5.40
2000	4.00	----	2.00
2005(BS II)	2.25	----	2.00

While pollutant gasses are comprised of harmful molecules, those molecules are composed of atoms. Because

of this, the best way to break down the gasses is to split the particles after they leave the engine but before they enter the air. While this may sound like a complicated process, it's quite simple. Catalysts are chemicals that speed chemical reactions without changing their overall process. A catalytic converter, meanwhile, is a metal implement bolted to the underside of the car. It is comprised of an input and output pipe. The input pipe pulls hot fumes from the engine, while the output pipe pushes vapors out. As the gasses from the engine blow over the catalyst, it creates a series of chemical reactions designed to alter the gasses and convert them into gasses that will not harm the environment. While catalytic converters don't eliminate air pollution, they can be instrumental in reducing immediate, localized air pollution, including pollution from roadways. Catalytic converters also work best when they're warm, which takes about 10-15 minutes of driving or [idling](#). This means your car may still churn out emissions for the first few minutes of a trip.[2]

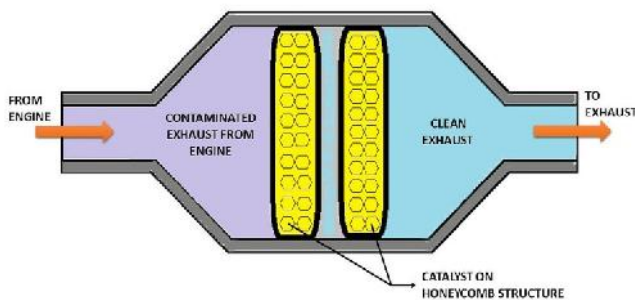


Figure 1: Catalytic Converter.[1]

## II. PROBLEM STATEMENT

In this project work our aim is to reduce the level of pollution of two stroke engine of Tvs-scooty moped. We all know that two stroke engine has more emission level due to Poor vehicle maintenance, the misuse of lubricant, the adulteration of gasoline and the lack of catalytic converters exacerbate two-stroke engine emissions. The age and poor maintenance of many two and three-wheelers in the region increase emissions well above any applicable standards. In addition, many drivers use lubricants and fuels of poor quality. Two-stroke engines use the “all loss lubrication” system which leads to formulation of emission of smoke and particulates. The problem is further enhanced because three-wheeler drivers tend to use excessive oil of poor quality. If just these things could be controlled, the pollution levels can drop drastically. Delhi banned the sale of loose lube oil, and made it compulsory for it to be pre-mixed with petrol, ensuring that they use the right quantity and quality. Both, the quantity and quality of lubricant used, affect the level of hydrocarbon and particulate emissions from two-stroke

engines. Vehicle manufacturers recommend adding 2% lubricant for two-wheelers and 3% lubricant for three-wheelers. But many drivers of three wheelers add considerably more lubricant for several reasons.

- Lack of knowledge about the correct amount of lubricants to be used.
- Addition of excess lubricant to gasoline by filling station attendants at the point of sale.
- Perception that more lubricant will provide greater protection against piston seizure.
- Lower miscibility of straight mineral oil and conventional motor oils with gasoline compared to 2T oil.

Along with above mentioned reasons one more reason is that Vehicular emissions are exacerbated by the age of the vehicle fleet and the poor state of vehicle maintenance. To tackle the same problem of emission we decided to use catalytic converter on two stroke engine and accordingly we started to design for the same.[2]

As per above discussions we can note that there are numerous factors due to which emission increases but by using catalytic converter we can reduce its level up to certain extent by simultaneously controlling other factors too. In our most of the observations we found that catalytic converter is present in four stroke engine. The effect of using catalytic converter we can see in the PUC test, which is conducted before and after using the catalytic converter.

## III. METHODOLOGY

Following methodology has been adopted for achieving the desired aim,

1. Suitable design of catalytic converter is made to suit the available engine exhaust system of the moped.
2. Actually manufacturing of catalytic converter is done as per the design.
3. Before installing the catalytic converter PUC test-1 is conducted by the authorized PUC test center and corresponding readings of CO and HC are noted down from the PUC certificate.
4. After installing the catalytic converter PUC test-2 is conducted by the authorized PUC test center and corresponding readings of CO and HC are noted down from the PUC certificate.
5. The difference in readings between two PUC tests is calculated for evaluating the performance of the engine.



Actual Catalytic converter used on Moped

**IV. RESULTS AND DISCUSSIONS**

Before using the catalytic converter PUC test-1 is conducted and the corresponding readings for CO and HC are as follows,

Table 2: Readings for CO and HC before using catalytic converter.

Sr. No.	Gases	Level
1	Carbon monoxide(CO) in percentage	0.189
2	Hydro carbon(HC) in PPM	190
3	Non-Methane HC	-
4	Reactive HC	-

After using the catalytic converter PUC test-2 is conducted and the corresponding readings for CO and HC are as follows,

Table 3: Readings for CO and HC after using catalytic converter.

Sr. No.	Gases	Level
1	Carbon monoxide(CO) in percentage	0.166
2	Hydro carbon(HC) in PPM	154
3	Non-Methane HC	-
4	Reactive HC	-



PUC test-1 Results before using catalytic converter.



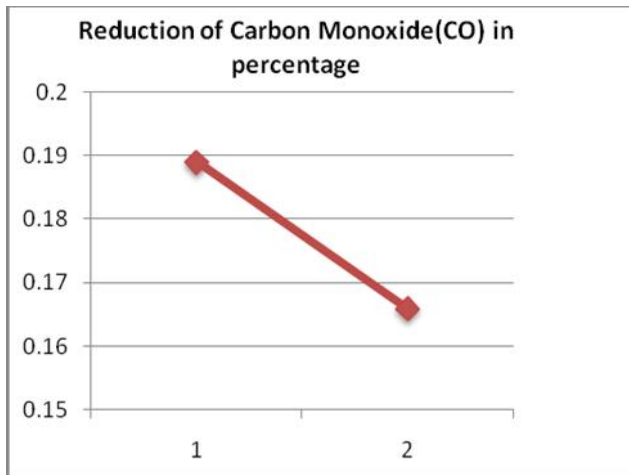
PUC test-2 Results after using catalytic converter

Table 4: Percentage of emission decreased after using catalytic converter.

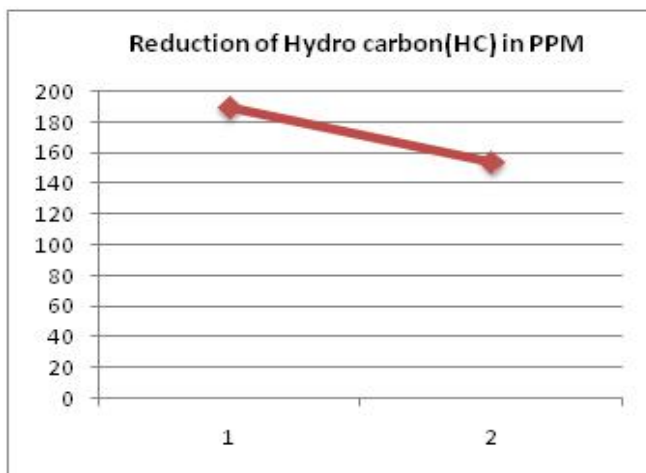
Sr. No.	Gases	Before using catalytic converter	After using catalytic converter	Decreased reading	Percentage of decrease
1	Carbon monoxide(CO) in percentage	0.189	0.166	0.023	12.17
2	Hydro carbon(HC) in PPM	190	154	36	18.95
3	Non-Methane HC	-----	-----	-----	-----
4	Reactive HC	-----	-----	-----	-----



From Table 4 we can say that after using catalytic converter CO and HC percentages got decreased by **12.17%** and **18.95 %**, so we can say that objective of reducing emission is achieved. The effect of using catalytic converter we can see from the following graphs.



Graph for reduction of Carbon Monoxide(CO)



Graph for reduction of Hydro Carbon(HC)

## V. CONCLUSION

After completing this work following things are concluded,

1. Emission of two stroke engine decreases by using catalytic converter.
2. Engine works efficiently without affecting its
3. performance .
4. Exhaust system with catalytic converter decreases power at high rotational speed.

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