

Compliance of Vehicles with Bharat Stage Emission Standards: A Study

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Abstract: *This research aims to study the Bharat Stage Emission Standards, to collect the data of actual emissions of CO and HC of two wheelers from PUC centres and to compare the standard norms set by Government authority and the actual measured emissions. The actual data was collected by doing a survey at various PUC centres authorised by Motor Vehicles Department, Maharashtra, in Pune city with prior permissions. The conclusions of this study are, Bharat stage emission standards shows that the BS VI norms are strict as compared to BS IV norms, the emissions of major pollutants that are CO (Carbon monoxide) and HC (Hydrocarbons) were studied at idling condition, Actual average CO emission of BS III and BS IV vehicles is less than the standard value. Similarly, Actual average HC emission of BS III and BS IV vehicles is less than the standard value and the actual emission from two wheelers was under the limit set by the concerned pollution control authority.*

Keywords: *Bharat Stage Emission Standards, Compliance, Pollution, Vehicles.*

I. INTRODUCTION

Bharat stage emission standards (BSES) are emission standards instituted by the Government of India to regulate the output of air pollutants from compression ignition engines and Spark-ignition engine equipment, including motor vehicles. The standards and the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment, Forest and Climate Change. ^[1]

The standards are based on European regulations. They were first introduced in the year 2000. All new vehicles manufactured after the implementation of the norms have to be compliant with the regulations. ^[2] Since October 2010, Bharat Stage (BS) III norms have been enforced across the country. Bharat Stage IV emission norms have been enforced for entire country since April 2017.

The Indian government announced that the country would skip the BS V norms altogether and adopt BS VI norms by 2020. ^[4] In its recent judgment, the Supreme Court has banned the sale and registration of motor vehicles conforming to the emission standard Bharat Stage IV in the entire country from 1 April 2020.

Table 1. Indian emission standards (2 wheelers)

Standard	Reference	Date
BS II	Euro 2	1 April 2000
BS III	Euro 3	1 April 2010
BS IV	Euro 4	1 April 2017
BS VI	Euro 6	April 2020

Upgrading the emission norms requires the manufacturing companies to upgrade their technology, which in turn increases the cost of the vehicle. Cost is one of the main reasons for the slow upgrade of emission standards. Fuels also play a crucial role in meeting these emission norms. Fuel specifications have also been aligned to its corresponding European production norms.

Emission standards are different for two wheelers and four wheelers which are set by the Central Pollution Control Board under the Ministry of Environment, Forest and Climate Change. In metro cities the number of

two wheelers is more as compared to four wheelers. Therefore, the researcher decided to study the amount of pollutants emitted by two wheelers which further include mopeds and bikes.

Pollution Under Control (PUC) Certification

The PUC certificate is a document that any person driving a motor vehicle can be asked to produce by a police officer. There are authorized pollution checking centres for petrol, CNG and diesel vehicles all over the city. The PUC certificate involves following information:

Certificate Sl. No., Registration No., Chassis No., Engine No, Class of Vehicle, Model Vehicle Category, Engine Stroke (2/4): 4 Stroke, Date of Registration, Emission Norms, Fuel, Date of Testing.

The computerised model for pollution check was developed by the Society of India Automobile manufacturers. A gas analyser records the emission value and sends it to the computer directly. Subsequently a certificate may be issued if the emission values are within the limits.

II. LITERATURE REVIEW

A few researchers have carried out study on the Bharat stage emission norms, its effects on the vehicle manufacturer and oil industry, environment etc. while few others did research on study and modification of catalytic converters to comply with future emission norms.

Pothumsetty and Thomas through their research aims at comprehending information on a new perspective of understanding the concept and how helpful it will be in understanding the shift from BHARAT STAGE IV to VI for various stakeholders. Followed by strategies adopted by top five Indian based car manufactures.^[5]

Shelke et. al. analyses the various Bharat stage norms, disadvantages and appropriate solutions for emission and also explain the importance of proper emission.^[6]

Shah and Patel aims to provide a solution for engines not from the manufacturer side but from the consumer side to upgrade their vehicle to satisfy future emission norms so that human health will be less affected by such emissions.^[7]

L. Venkatesh et. al. in their paper explains automobile exhaust emissions and its knock, automobile exhaust pollutants levelled with platinum catalyst in catalytic converter, story of catalytic convertor, categories of catalytic convertor, and disadvantages of catalytic convertor and also attainments of catalytic convertor.^[8]

Mukherjee et. al. focuses on study and importance of catalytic converter in automobile exhaust system to follow the emission norms set by the pollution authority.^[9]

After reviewing the related literature the researcher find the gap that there is no work done in this area therefore he decided to study whether the vehicles comply with the Bharat Stage norms set by the Government.

III. RESEARCH OBJECTIVES

1. To study the Bharat Stage Emission Standards.
2. To collect the data of actual emissions of CO and HC from two wheelers from PUC centres.
3. To compare the standard norms set by Government authority and the actual measured emissions.

IV. RESEARCH METHODOLOGY

The researcher has collected the information regarding the Bharat Stage Emission Standards from the website of Central Pollution Control Board under the Ministry of Environment, Forest and Climate Change. Actual data was collected by doing a survey at various PUC centres Authorised by Motor Vehicles Department, Maharashtra, in Pune city with prior permissions. The PUC Certificate shows that the vehicle conforms to the standards prescribed under rule 115(2) of CMV Rules 1989.

V. ANALYSIS AND INTERPRETATION OF DATA

According to the survey conducted by the researcher, PUC certificates of 18 BS III and 5 BS IV 2 wheelers were studied. The emissions of major pollutants that are CO (Carbon monoxide) and HC (Hydrocarbons) were studied at idling condition.

Table 2. Comparison of actual CO emission with standard values

Bharat stage	No. of vehicles	CO % (recommended)	Average CO%(actual)
BS III	18	3.5	1.27
BS IV	5	3.0	0.15

Table 2 indicates that the actual average CO emission of BS III vehicles is 1.27% which is less than the standard value of 3.5%. Whereas in comparison with the 3% standard value for BS IV vehicles, the actual average CO emission is only 0.15%. Actual average CO emission of BS III and BS IV vehicles is less than the standard value.

Table 3. Comparison of actual HC emission with standard values

Bharat stage	No. of vehicles	HC in ppm (recommended)	Average HC in ppm (actual)
BS III	18	4500	524.5
BSIV	5	3000	135.2

Table 3 indicates that the recommended HC emission (ppm) from 2 wheelers should not exceed 4500 according to BS III and 3000 according to BS IV. Following the norms, the actual average HC (ppm) for BS III vehicles is 524.5 and for BS IV it is 135.2. Actual average HC emission of BS III and BS IV vehicles is less than the standard value.

VI. DISCUSSION AND REVIEW

The conclusion of this research is Bharat stage emission standards shows that the BS VI norms are strict as compared to BS IV norms. Pothumsetty and Thomas also recorded the same observation. The research also concludes that the actual average CO emission of BS III and BS IV vehicles is less than the standard value. Similarly, Actual average HC emission of BS III and BS IV vehicles is less than the standard value.

Thus the actual emission from two wheelers was under the limit set by the concerned pollution control authority, but still the metro-cities are highly polluted. We have to find out the major contributors to the overall pollution in the metro-cities. The 10 to 20 years old vehicles clear the test showing very low emissions. There is a necessity to check if credible, authentic and reliable tests are being conducted to identify gross polluters. The norms should be more stringent in India.

According to the survey, the number of BS III vehicles was more in comparison with the number of BS IV and BS VI vehicles. This may be the reason due to which the pollution is high even if BS VI norms are made mandatory.

The two wheeler manufactures and the oil treatment plants are following the norms strictly and therefore, the emissions are under control for most of the vehicles for long period of time.

VII. CONCLUSIONS

Bharat stage emission standards shows that the BS VI norms are strict as compared to BS IV norms.

The emissions of major pollutants that are CO (Carbon monoxide) and HC (Hydrocarbons) were studied at idling condition.

Actual average CO emission of BS III and BS IV vehicles is less than the standard value. Similarly, Actual average HC emission of BS III and BS IV vehicles is less than the standard value.

The actual emission from two wheelers was under the limit set by the concerned pollution control authority.

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