

COMPARISON BETWEEN BHARAT STAGE IV AND BHARAT STAGE VI: A REVIEW

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Abstract: In India, pollution has become very serious issue. Burning of crop field, increased number of conventional fuels vehicles, smoke from industries, and others are reason behind reduction of air quality. Growing demand of automobiles in India has increases the need of emissions standards to overcome from pollution. BSES (Bharat stage emission standards) are exhaust emission standards instituted by the Government of India to standardise the amount produced of air pollutants from CI (compression ignition) engines and SI (Spark-ignition) engines gear, including motor means of transportation. This review is about difference in BS-IV and BS-VI emissions standards. Emissions limit of these are discussed in this paper.

Keywords: BS-IV, BS-VI, CI Vehicle, Pollution, SI vehicle

Nomenclature:

BS-IV: Bharat stage IV

BS-VI: Bharat stage VI

CO₂: carbon dioxide

HC: hydrocarbons

PM: Particulate matter

PN: Particle number

NOX: oxides of nitrogen

DPF: diesel particulate filter

DOC: diesel oxidation catalyst

CI: compression ignition

I. INTRODUCTION

Air contamination is the presentation of synthetic compounds, particulate matter, or natural materials that reason mischief or inconvenience to people or other living life forms, or cause harm to the common habitat or constructed climate, into the air. The environment is a mind boggling dynamic common vaporous framework that is vital for help life on planet Earth. Stratospheric ozone consumption because of air contamination has for some time been perceived as a danger to human wellbeing just as to the Earth's environments. So, the Bharat stage emission standards and the basic emission standards issued by the Indian Government regulates and standardise the air pollution that is produced by exhaust of vehicles and IC (Internal combustion) engines these standards are usually set by the central pollution control board. [1]

Air pollution is caused by different sources as shown in figure 1. Some of them are stationary, some are mobile. Mobile sources (Automobiles) are the main reason behind air pollution. Stationary sources like power plants, industries, and sewage plants, are known as point sources of pollution. Area sources are comprised of bunches of more modest contamination sources that are certifiably not a serious deal without help from anyone else however when considered as a gathering can be. Natural sources can now and then be critical yet don't as a rule makes progressing air contamination issues like the other source types can.

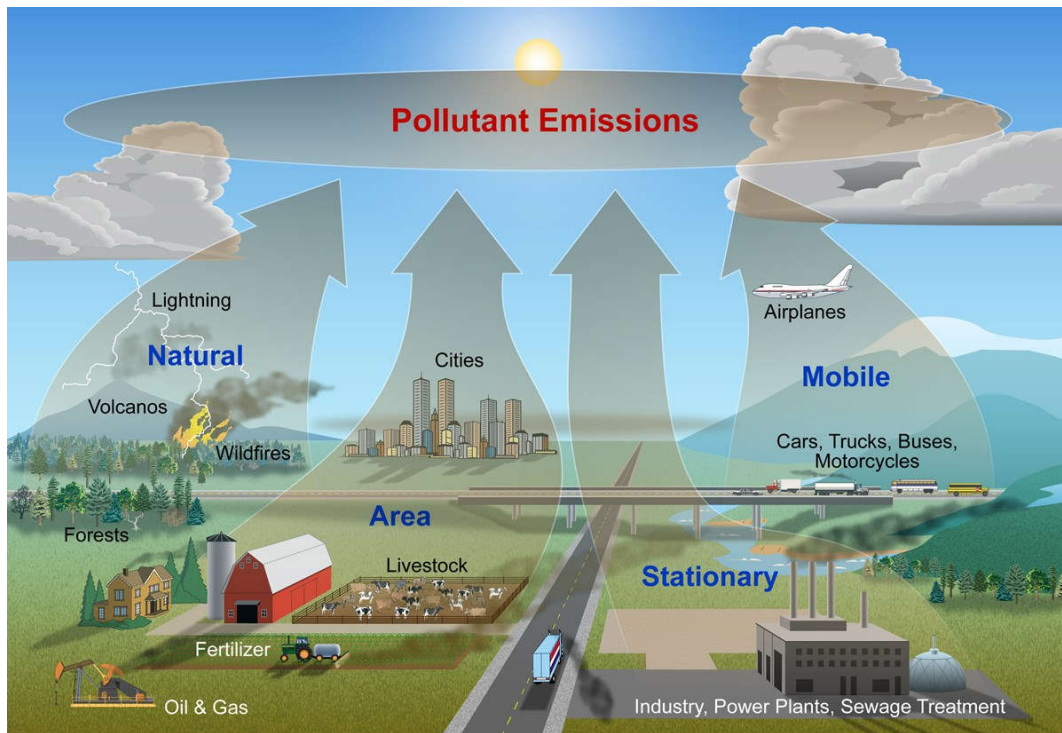


Fig 1: Different sources of air pollution

There are many certain methods to reduce the amount of vehicle emissions. Use of bio-fuels also proved that emissions are less as compared to conventional fuels. Use of blended fuels: mixture of two or more fuels results in less emissions. And other is to improve technology factor like use of catalytic filter, EGR (Exhaust Gas Recirculation), DPF (Diesel Particulate Filter) and many more. Bharat Stage norms are made to control the exhaust emissions by using such technologies along with the use of dedicated fuel norms.

II. BHARAT STAGE

These Emission Standards are instituted by Government of India to control the production of contaminants in the air from internal combustion engine apparatus, together with motor vehicles. The guidelines and the course of events for execution are set by the Central Pollution Control Board under the Ministry of Environment and Forests. The guidelines depend on guidelines set by European nations and was first acquainted with the world in 2000. BS-IV outflows standards have been set up since April 2010, and it had been endorsed for the whole country in April 2017. In the year 2016 the Government of India declared that the nation would skip Bharat stage V standards out and out and would execute the BS-VI by 2020. The new principle passed by the Supreme Court said that they would boycott the deal and enlistment of the engine vehicles that are incorporated with the BS-IV discharge standards in the entire country by April first 2020. Essential Sources of Pollutants and Its Effects on Human Health are fundamentally a result of internal combustion engines (ICEs) which are predominantly infamous for the creation of carbon monoxide, carbon dioxide (CO₂), oxides of nitrogen and Hydrocarbons. Particulate matter (PM), or carbon ash, is another side-effect of diesel just as internal combustion engines right now radiated by BS-IV vehicles.

2.1 Bharat stage IV (BS-IV)

On July 4, 2014, India finished the fourth phase of emission norms for mechanized two wheeled vehicles. The Bharat Stage (BS) IV norms will become effective for type endorsement of new bike models in April 2016, and for all cruiser models in April 2017. The new principles fix the HC+NOX emanation limits contrasted and the current BS III guidelines by 23%–60%, contingent upon cruiser class. Furthermore, the new guideline sets up the primary evaporative outflow norms for bikes in India. BS IV builds up that crankcase emanations structure BS IV bikes are precluded from discharge into the atmosphere.[2]

The BS IV guidelines give producers some adaptability by permitting certificate under two unique arrangements of evaporative and tailpipe exhaust limits. The option evaporative emission guidelines permitted in Bharat IV are 2 or 6 grams of hydrocarbons (HC) produced during the sealed housing for evaporative determination (SHED) test. Manufacturers can choose to convey vehicle plans ready to meet the lower evaporative emission standard (e.g., sealed fuel systems) and depend less on tailpipe HC outflow controls, or select the higher evaporative emission standard and utilize engine and after treatment frameworks to accomplish lower tailpipe HC discharges, contingent upon which is the more practical answer for them.

2.2 Bharat Stage-VI (BS-VI)

The guidelines apply to light-and substantial vehicles, just as two-and three-wheeled vehicles. As proposed, the BS VI norms will become effective for all vehicles in these classes fabricated on or after April 1, 2020. The draft BS VI proposition indicates mass emission guidelines, type endorsement necessities, and on-board diagnostic (OBD) system and sturdiness levels for every vehicle classification and sub-classes in that. Also, reference and commercial fuel determinations are remembered for the BS VI proposition. The appropriation of the proposed BS VI discharge norms will basically bring Indian engine vehicle guidelines into arrangement with European Union guidelines for light-duty passenger vehicles and commercial vehicles, hard core trucks and transports, and two-wheeled vehicles. While not yet arriving at European levels, more rigid emission guidelines are likewise set for three-wheeled vehicles. BSV level emission norms and move straightforwardly to the more rigid and hearty BSVI level. The proposed BS VI principles are expansive in scope and join significant changes to existing Bharat Stage III and IV emission norms. Of specific note is the fixing of particulate matter (PM) mass discharge limits and the presentation of particulate number (PN) limits for light-and heavy duty vehicles (LDV, HDV) fitted with gasoline direct injection (GDI) and compression ignition (CI), or diesel engines As proven by the selection of ostensibly comparable PM and PN standards in Europe, this phase will likely lead to the near-universal application of DPF to control PM emissions from new diesel LDVs and HDVs.[3]

III. EMISSIONS LIMITS COMPARISON OF BS-IV AND BS-VI

Figures 2 below shows the comparison of BS-IV and BS-VI discharge cut off points of Spark start vehicles. In tally to the contaminations appeared here, BS VI PM and PN emission limits are indicated for LDVs fitted out with gasoline direct injection engines. For two-and three-wheelers, BS IV HC+NOX emission controls shown are for vehicles meeting a 2.0 g/test evaporative emission standard. Tailpipe HC+NOX emission limits are more unbending for vehicles proficient with evaporative emissions between 2.0 and 6.0 g/test.

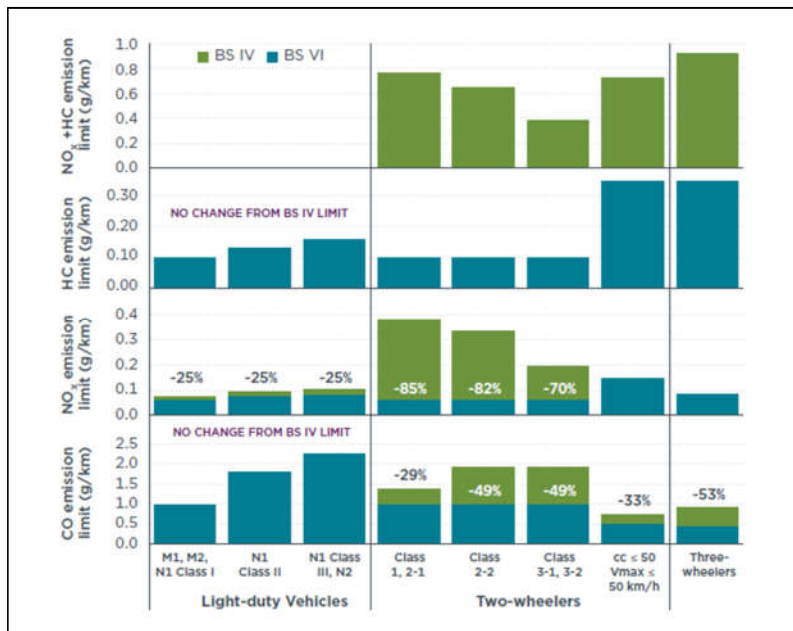


Fig 2: SI vehicles BS IV and BS VI pollutants range.

For compression ignition vehicles BS-VI is different as amount of emissions from tailpipe is different from spark ignition vehicles. Also after treatment technologies like DPF and DOC are used in Diesel engines in order to reduce nitrogen oxides, carbon monoxides and hydrocarbons emissions from vehicles. [1]A diesel oxidation catalyst (DOC) is an after treatment segment that is intended to change over carbon monoxide (CO) and hydrocarbons into carbon dioxide (CO₂) and water. It separates poisons in the fumes stream from a diesel engine, assisting with diminishing particulate matter (PM). Diesel particulate filters (DPF) are gadgets that actually catch diesel particulates to forestall their delivery to the air. Diesel particulate filter materials have been built up that show great filtration efficiencies, in abundance of 90%, just as great mechanical and warm sturdiness.

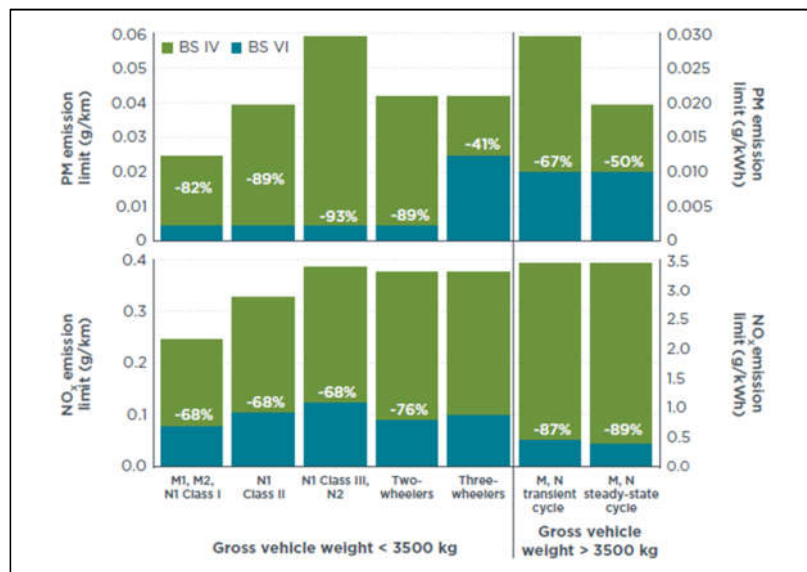


Fig 3: CI vehicles BS IV and BS VI pollutants range.

IV. LITERATURE REVIEW

- Rohan Pothumsetty and Mary Rani Thomas concluded that BS-VI norms have great contribution in reducing emissions of vehicles. BS-VI leads to alternate technical solutions for reducing vehicle emissions. Cost of diesel engine vehicles is affected because more changes are required in that. [1]
- Ben Sharpe and Oscar Delgado shows about the latest technology introduced in order to reduced emissions and fall within emissions limit.[4]
- India Bharat stage VI emission standards policy update article on ICCT. It shows updated policy of BSVI in India on various types of automobiles.[5]
- Bharat stage IV emission standards fortwo-wheelers in India. It is about BS-IV emissions limit that to be applied on two wheelers vehicle.[2]
- Amit A. Patil et al. concluded that BS-VI is going to be more effective and efficient for the vehicles. It can reduce more emissions from vehicle and improve their efficiency.[3]

V. CONCLUSION

1. BS-VI will be more effective for both the vehicle and environment as it can reduce vehicle emissions by using different technologies and improve vehicle efficiency.
2. Further research can be done using different technologies so that emissions can be reduced to the lower level without compromising in engine efficiency and power output.

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