

EPCA report number 10 (November 2004)

**Special report: The implementation of the in-use emission norms as amended by the  
Union government in February 2004**

**(In the matter of W.P.(C) No.13029 of 1985; M.C. Mehta v/s UOI & others)**

**Environment Pollution (Prevention & Control) Authority  
for the National Capital Region**

## **1. Report on the implementation of the new in-use emission norms**

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All in-use vehicles in India are required to have a valid Pollution Under Control (PUC) certificate. This simple PUC checks exists from the year 1991 for all on-road vehicles as per CMV rule No 116. Privately run PUC centres authorised by the Regional Transport Authority (RTA) undertake emission check for all in-use vehicles.

But even as emission norms for the new vehicles were made stringent, the government did not revise the norms for checking the emissions from the in-use fleet. Therefore, the old vehicles (which clearly would emit higher), were regulated at par with new vehicles, which should be emitting lesser emissions This issue was brought to the Hon'ble Supreme Court's attention by EPCA in its report *Second generation reforms for air pollution control in Delhi: Examination of the issues raised in the IA 179 submitted by the Amicus curiae* submitted to the Hon'ble court in April 2003. Finally, in February 10, 2004, the Ministry of Road Transport and Highways (MoRTH) revised the in-use emissions norms, which are to be implemented across the country from October 1, 2004.

## **2. The new in-use emission norms**

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The changes proposed in GSR 111 (E) dated February 10, 2004, which are slated for introduction from October 1, 2004 can be classified in the following categories:

For petrol vehicles for the first time hydrocarbons (HC) norms have been introduced. Initially for petrol vehicles only carbon monoxide was measured. Similarly also the norms have been adopted based on the technology levels of a vehicle. For instance, Bharat Stage II vehicles have to meet tighter norms as compared to non Bharat Stage II norms.

For four-wheelers without catalytic converters the proposed limit values for idle CO and HC are 3.0 per cent and 1,500 ppm respectively. For new passenger cars with catalytic converters the corresponding proposed limit values for CO and HC are 0.5 per cent and 750 ppm respectively. The norms also have given an option to state governments to introduce lambda measurement with necessary notification.

But an expert study conducted by the Centre for Science and Environment in 2003, *A Plan for Progress* had pointed out studies from round the world for comparable vehicle technology show that the HC level of more than 1,000 ppm at idle is very rare. For all light duty vehicles below 3,500 kg gross vehicle weight ratio (GVWR) without catalytic converters, corresponding HC level should be in the range of 600-700 ppm. Therefore, the amended norms are relatively poor in terms of global practice and technology capability.

For two and three wheelers the norms have been differentiated according to the technological levels, thus four-stroke have to meet lower HC norms as compared to the two-stroke. The new limit values for idle CO and HC for two and three-wheelers: 9,000 ppm HC for two-stroke engines and four stroke engines manufactured on and before March 31, 2000. While four-stroke engines after manufactured March 31, 2000 have to meet 4,500 ppm HC, those for two stroke it is 6,000 ppm. While the CO limit at 3.5 per cent remains same for both the categories. However many experts are of the opinion that the HC norms are too lenient for new two-wheelers and do not match the engine

technology. A small survey conducted by ARAI shows clearly that no new two-wheelers would fail at PUC centres. In view of the fact that limit values should correspond to the engine technology and that 20 per cent failure rate is acceptable, there is a strong need for reconsidering the limit values.

*The notification also allows state governments to mandate, if the need be, tighter emission norms for in-use vehicles.*

Clearly the revised norms though inadequate are important step forward to check the emissions of the existing in-use vehicular fleet. In particular, the introduction of lambda measurements will help note the effectiveness of the catalytic converters in the vehicles. If enforced properly, these norms would help reduce pollution from in-use vehicles.

The implementation of the new norms would require the following:

- a. The upgradation of equipment specifications, smoke meters and gas analysers to check the emissions of vehicles;
- b. Revision in the test procedures for free acceleration smoke measurements for diesel vehicles;
- c. Implementation of a code of practice for PUC equipment manufacturer/supplier and PUC centre operator

**Comparison of the old and new norms for inuse emissions from Petrol/CNG/LPG driven vehicles**

Sr No	Vehicle type	Earlier norms CO in % by volume	Revised norms CO in % by volume	HC (n-hexane equivalent ppm)
1.	2&3 wheelers (2/4 stroke) manufactured on and before 31 March 2000	4.5	4.5	9,000
2.	2&3 wheelers (2 stroke) manufactured after 31 March 2000	4.5	3.5	6,000
3.	2&3 wheelers (4 stroke) manufactured after 31 March 2000	4.5	3.5	4,500
4.	Bharat Stage II compliant 4 wheelers	3.0	0.5	750
5.	4-wheelers other than Bharat Stage II compliant	3.0	3.0	1,500

**For diesel vehicles**

Method of test	Maximum smoke density
<i>Free acceleration test for turbo charged engine and naturally aspirated engine—Hartidge units 65</i>	Hartidge units 65

**Spark ignition vehicles (petrol, CNG, LPG)**

According to the new in-use norms, the PUC testing equipments would have to be upgraded/modified. Automotive Research Association of India (ARAI) has approved the current PUC equipments in the field for the carbon monoxide (CO) analyser, though it is capable of measuring hydrocarbons (HC) also. With the introduction of the revised norms, it is necessary that the existing 2 gas analyser, but certified for only one gas (CO), be approved by ARAI additionally for the HC also. As per the Code of Practice and Type Approval Procedure (TAP) document, the original equipment manufacturer will modify the existing gas analyzer (capable of measuring CO and HC) so that it can also measure HC and submit to ARAI- the certification agency for approval. This would make it possible for 2-gas analyser to measure two-wheelers, three-wheelers and pre Bharat Stage II vehicles.

For certifying Bharat Stage II and post Bharat Stage II vehicles, the PUC centres would have to invest in 4-gas analyser, as the 2-gas analyser does not have the necessary accuracy to measure the tighter emission norms with respect to Bharat Stage II compliant four wheelers. For measuring the Bharat Stage II and post vehicles it is necessary that the equipment have to be complied to the high accuracy level of OMIL standards Class-I. The specification of the equipment that is required for the measurement as per the revised PUC norms are based on standard ISO 3930. The average cost of 4-gas analyser in the market comes to around Rs 1,80,000 to Rs 2,50,000. A four-gas analyser is also necessary for the measurement of lambda.

### **Diesel vehicles**

For testing diesel vehicles smoke meters are used. With the introduction of the new norms, the smoke meters will have to be upgraded. The prescribed free acceleration test requirements include measurement of oil sump temperature and engine rpm while recording the smoke density readings. The manufacturers would carry out the upgradation for the existing equipment to meet the revised tests procedures, and then get it approved by ARAI. The cost of upgrading the smoke meter has been fixed at Rs 40,000 by ARAI. The manufacturer will then issue a compliance certificate to the respective PUC center based on which the concerned transport authorities will be granting the extension of validity to the PUC test center for the purpose of PUC testing as per revised norms.

Apart from these requirements both the PUC manufacturer/supplier and also the PUC centers have to enter into an annual maintenance contract and adhere to a code of practice. For instance the code of practice for the PUC centers require:

- The Type Approval certificate supplied by PUC equipment manufacturer /supplier shall be displayed in the PUC center.
- The Operator training certificate issued by PUC equipment manufacturer /supplier shall also be displayed in the PUC center.
- PUC operator shall submit the monthly report of all tested in-use vehicles along with test printout in original to the Transport Department.

### **3. EPCA's review of the implementation of the new norms in the country**

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EPCA had the opportunity to review the implementation of the new in-use emission norms throughout the country. EPCA has talked to various key officials of different state

transport departments, and state pollution control board. EPCA had called the meeting of all the stakeholders in the implementation of the new in-use norms on September 4, 2004. Thus the PUC equipment manufacturers/suppliers, their associations, the Delhi transport department and the certification agency represented the meeting. Though it was decided that the programme would be under way across the country, it is disquieting to note that the programme has failed to take off. EPCA takes a firm note of the same. EPCA would like to point out that emissions from old in-use vehicles are the biggest challenge for the city governments today. But no city governments has a detailed time bound implementation plan for the new in-use norms and as a result PUC centres across the country are ill prepared to start the new programme even after repeated communications from the MoRTH.

Surprisingly also no figures are available on the total number of PUC centres in the country. Clearly every state government has to be made accountable for implementing the new in-use norms. PUC certification is a multi crore business, but it has been made unprofitable due to sheer lack of enforcement from the state governments.

While Delhi has announced November 1, 2004 as the new deadline for implementing the new in-use emissions norms, various other state departments are dithering and are seeking an extension from the state governments by at least 3 months. Initially the manufacturers were lagging behind in getting the type approval certificate from the ARAI. But things have changed since then. As of October 27, 2004, there are enough instruments manufacturers, which have got the necessary approvals for selling their equipments. Clearly now the onus is on the state governments to enforce the PUC programme.

### **3.a. Review of implementation in Delhi**

Concern over the derailment of programme for implementing the new in-use norms, EPCA also called a meeting of the PUC operators in Delhi on October 23, 2004. The President and key official of the Delhi Petrol Dealers Association (DPDA) and the Delhi transport department were present in the meeting. EPCA expressed its grave concern over the non-implementation of the new in-use norms in Delhi. Based on the deliberations with the DPDA and the Delhi transport department it was agreed upon that December 15, 2004 would be the final deadline for implementing the new norms in Delhi. The DPDA has assured EPCA that the programme would be underway from December 15, 2004, across all the centres in the city. DPDA also assured that PUC centres would measure Lambda from December 15, 2004 for all gasoline vehicles fitted with three-way catalytic converters. Delhi government would also do the necessary groundwork for smoother implementation of the norms and for enabling the measurement of Lambda. EPCA feels that the Delhi government should start the necessary groundwork so that it facilitates the introduction of lambda measurement in Delhi.

## **4. EPCA's observation**

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Meanwhile EPCA would like to point out certain technical issues for making the PUC system more effective in the country, for the smoother implementation of the norms, and avoiding costly investments in future.

#### 4.1 The need to invest in the right technology

The new in-use norms as discussed above has set different norms for different vehicular technology, and hence Bharat Stage II vehicles would have to meet a different set of norms, as opposed to the pre Bharat Stage II vehicles. EPCA would like to point out that the state governments across the country should insist on PUC centres to invest in 4-gas analyser now, as it would be necessary in the near future. The whole country would be implementing Bharat Stage II norms from April 1, 2005. So investments should be made taking into consideration the future requirements. EPCA would therefore like to recommend that all PUC centres across the country should invest in a four-gas analyser, and avoid investing in a two-gas analyser.

#### 4.2 The need to ensure lambda measurements are incorporated in the programme

The February 2004 notification for the in-use emission allows the option to various state governments to set tighter in-use emissions standards than the central stipulations, and also for introducing lambda measurement as a part of the PUC programme. Given the possibility of introduction of lambda measurement in the future EPCA feels it is prudent enough to invest in a four-gas analyser, as two-gas analysers are not capable of measuring lambda, since they measure only two gases (CO and HC). For measuring Lambda it is necessary that all the four gases, CO, HC, CO<sub>2</sub> and O<sub>2</sub> are measured.

#### 4.3 The need to review the economics and management of PUC centres

PUC centres across the country are demanding higher fees under the new in-use emission norms. A higher investment price of new equipments (four-gas analyser) is one of reason behind such demands. EPCA has reviewed the economic viability of PUC centres using a 4-gas analyser based on information in Delhi. This economics will be dependent on the numbers of vehicles and the ability of the government to enforce the pollution under control programme.

The fees charged for issuing a PUC certificate varies across the country. But generally it is around Rs 25 per tests for petrol vehicles, and around Rs 50 for diesel vehicles. Delhi also has a similar PUC fee structure- for issuing a PUC certificate for petrol vehicles Rs 25 is charged and Rs 50 for diesel vehicles.

The total number of registered car/jeeps/station wagon and two wheelers in Delhi are 39,18,093. These are the registered figure, assuming the standard practice of taking 60 per cent of the registered figures as on-road fleet, there are around 23,50,855 vehicles on road in Delhi. Thus ideally these many numbers should go for a PUC test every three months. But it is well accepted that the PUC compliance rate in Delhi is very low (around 20 per cent). Thus roughly 5,00,000 vehicles go for a PUC tests every 3 months.

Data from the transport department however clearly shows that the vehicles actually taking PUC certificate in Delhi on an average is very high- to the order of 2.5 lakh per month (30 lakh vehicles per year). There are around 500 PUC centers in Delhi with 350 for petrol and 150 for diesel vehicles, with some having both the facilities.

**Estimated economics of a typical PUC center using a four-gas analyzer (petrol/CNG/LPG vehicles) in Delhi**

Year of operations	Investment cost	AMC	Other expenditures	Annual expenses	Annual earnings*	Balance
1	2,50,000	Warranty	36,000	2,86,000	1,82,500	(1,03,500)

2nd		14,000	36,000	50,000	1,82,500	1,32,500
3 <sup>rd</sup>		14,000	36,000	50,000	1,82,500	1,32,500
4 <sup>th</sup>		14,000	36,000	50,000	1,82,500	1,32,500
5th		14,000	36,000	50,000	1,82,500	1,32,500

\*(Assuming 20 vehicles a day per center, paying Rs 25 per tests. The numbers of petrol PUC centers are around 350)

It is apparent from this computation that the PUC centre is economically viable in the city of Delhi. This is in spite of the low compliance and the fact that the city has over 300 PUC centers, which many experts believe is too many for the city. Based on this computation, other cities should also work out their economics and set the institutional framework for the centers.

#### **4.4. The need for a national-level software for the PUC centres**

The Society of Indian Automobile Manufacturers (SIAM) has developed a new computerised PUC programme. Many cities in the country have introduced computerised PUC centres. EPCA is concern over the issue of software in the computerised PUC centres. Currently each state government has a different format for the PUC certificates they issue. The software thus differs according to the requirements of the different state governments. The individual states design their own format according to their needs and hence there is no one standard PUC certificate format, which in turn would enable standard software across the country. As a result of which a manufacturer have to develop different software for different markets.

MoRTH doesn't have a standard format across the country for issuing PUC certificate, which has led to this different format across the country. The ideal step would be to have common format for all the PUC computerised centres across the country. EPCA recommends that MoRTH should take up the issue and prescribe a standard format across the country.

In the absence of this control on software, EPCA has noted that malpractices are on the increase. For instance, it has been brought to EPCA's notice that in regions neighbouring Delhi, there are many place, where the computerised PUC centres does not exist, which can check the emissions of vehicles. But what does exist is a centre with a computer, which has the software to issue a PUC certificates.

At many centres also though they have the necessary equipments with the computers, the computers are not connected to the analyser. Clearly this has to be stopped. The onus lies on various state governments to ensure that the programme runs effectively without any malpractices.

#### **4.5 The need for data collection and analysis**

EPCA would like to point out that currently the computerised PUC centres are not connected to a central server. Even today, for instance, in Delhi with over 300 computerised centres, not one is connected to a central server. The data generated is not analysed or utilised for policy development.

EPCA would recommend that it would be very useful if all the centres are networked and the data of each vehicle checked would then be sent to the transport department daily through the same network. This collation of data would help immensely in policy

formulations. This would also enable the Transport department to issue notice to those vehicles who has not taken their PUC tests, even after the due date is over. The city of Hyderabad has taken a lead in this by connecting around seven PUC centres in a pilot scheme. This should become the model for all cities to follow.

#### **4.6 The need for stricter enforcement by conducting special drives on visible pollution**

The fact that a vehicle emits smoke means that the vehicle does not meet any emission norm. Across the world, governments conduct special drives to identify “visibly smoking vehicles”, which are clearly in violation of any emission norms in place. These are grossly polluting vehicles and stiff action needs to be taken to check these on the roads.

Recently the transport department, government of Delhi conducted a pollution drive against smoky transport vehicles in Delhi in the month of October. More than 1,300 vehicles were caught and their certificate of fitness (COF) was cancelled in the drive.

EPCA tried to look into this issue and was appalled by the fact that as of today there is very little that a state transport department could do legally to control visible smoke, both from transport vehicle and so also private vehicle. There are no legal provisions that could actually enable the state transport department to impound grossly polluting vehicles. Under the rules, in the case of commercial transport vehicles there is legal recourse of cancellation of fitness certificate. But as private vehicles do not require annual fitness certificates, there is no provision, under law, to take action against a polluting vehicle on the road.

Section 56 (4) under the Motor Vehicles Act, 1988 clearly points out, “the prescribed authority may for reasons to be recorded in writing cancel a certificate of fitness at any time, if satisfied that the vehicle to which it relates no longer complies with all the requirements of this Act and the rules made thereunder; and on such cancellation the certificate of registration of the vehicle and any permit granted in respect of the vehicle under Chapter V shall be deemed to be suspended until a new certificate of fitness has been obtained.” The state transport department enforces this section to control visibly polluting transport vehicles, but the same cannot be enforced for private vehicles.

If private vehicles are found emitting visible smoke, the transport department can ask for a PUC certificate. If the car owner already has the certificate, the department has the powers to just issue a notice for a fresh PUC test. If the car owner does not possess a PUC certificate, then the polluting car is fined Rs 1000 during the special pollution drive. Apart from this no firm action can be taken against private vehicles. This is the major gap in the current policy. While for transport vehicles the norms are stringent and action can be taken, private vehicles are beating the system, as they don't come under stringent legal cover. EPCA feels this should change. Powers, under legal cover, should accordingly be given to the state transport departments for bringing the private vehicles in the net. The transport departments across the country should be authorised to impound a private vehicle, if it is found emitting visible smoke. EPCA also recommends that the PUC centres licence, which has issued the PUC certificate to the smoky vehicle, should also accordingly be cancelled.

#### **4.7. The need to ensure compliance**

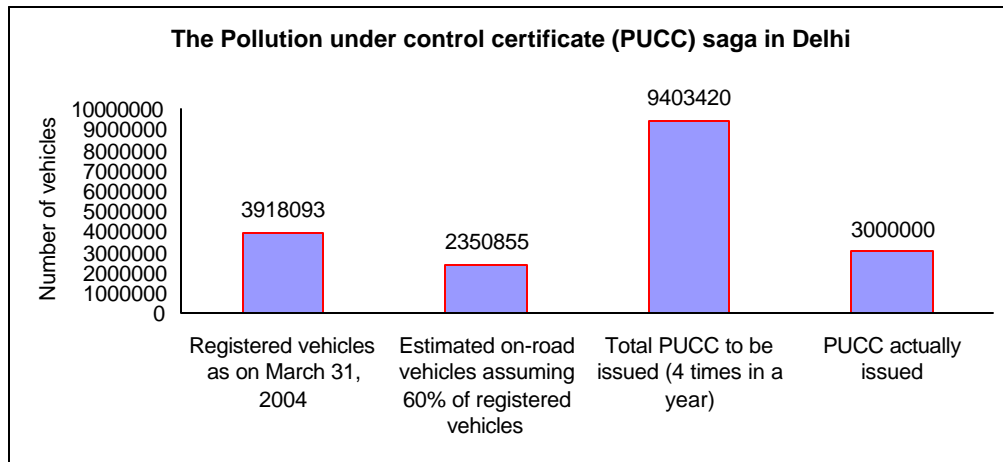
With regard to enforcement, it is clear that at present most vehicles are not even subjected to periodic PUC tests. A new system needs to be put in place that will deny renewal of annual insurance certificates to vehicles that do not have proof of having



passed valid PUC tests. In other words, the insurance of the vehicle should be linked to the certificate from the PUC centre, showing its compliance to emission norms.

The compliance levels in Delhi is also very low, even as it is hold as a role model by many state governments (See The compliance levels in Delhi).

#### The compliance levels in Delhi



Source: Delhi department of transport

It will not be out of place to observe that for a good I/M programme a proper vehicle registration system should be in place to record actual vehicles on road. For inspection and re-inspection of vehicles, the registration office must be able to trace problem vehicles and track their inspection status. The registration system should also detect vehicles that have not been inspected on time or have failed. It is advisable to rationalise the registration system to meet these objectives. It has been demonstrated that the actual vehicle registration data available from the state transport authority is not representative of actual number of vehicles on road. As a result, it is difficult to arrive at a realistic estimate of actual volume of inspection that would be required annually.

#### 5. EPCA's recommendations

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EPCA seeks following directions from the Hon'ble Court:

1. The Union government must be directed to ensure that state governments implement the new in-use emission norms. The amendments suggested by EPCA to improve the enforcement and compliance of the system must be considered and implemented. An action taken report on this matter must be submitted to the Hon'ble Supreme Court within 3 months.
2. The state governments of the following cities – Chennai, Bangalore, Hyderabad, Lucknow, Kanpur, Ahmedabad and Sholapur – identified by the Hon'ble Supreme Court for high particulate pollution – should be similarly directed to implement the new in-use emission norms. The state governments must report to EPCA on the progress made every 3 months.

EPCA will report to the Supreme Court every 6 months on the progress made.

3. The Union Ministry of Road Transport and Highways be directed to develop central software for all PUC centres, which would lead to a standard format across the country and avoid any kind of malpractices in future.
4. Union government and state governments be directed to conduct with regular periodicity visible pollution drives to identify grossly smoking vehicles and to ensure that these drives are given adequate publicity in the media. In case any vehicle, which is grossly polluting is found with a valid PUC certificate, then the state government must cancel the authorisation of the PUC centre. This information must be similarly posted on the official website and given publicity through different media.