

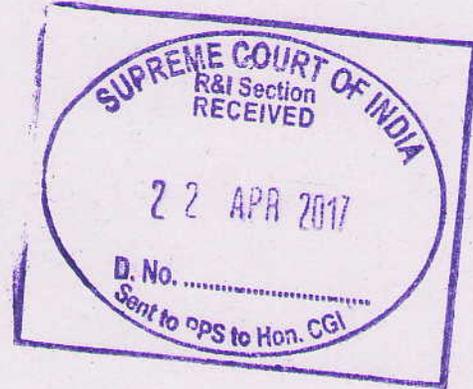
**ENVIRONMENT POLLUTION (PREVENTION & CONTROL) AUTHORITY
for the National Capital Region**

**Dr Bhure Lal
Chairman**

**EPCA-R/2017/L-25
April 24, 2017**

To:

**The Registrar General
Hon'ble Supreme Court of India
New Delhi**



**Sub: W. P. (C) No 13029 of 1985 M. C. Mehta v/s UoI & Others.
Hon' ble Supreme Court vide its orders dated January 17, 2017 and February 06,
2017 in W.P. (C) 13029 of 1985 M.C. Mehta Vs Union of India & Others**

Dear Sir,

I am hereby enclosing the report of the Environment Pollution (Prevention & Control) Authority for the National Capital Region (EPCA), Final Report on functioning of PUC Centres in Delhi-NCR.

Kindly arrange to place the report before the Hon'ble Court.

Yours faithfully,

**(Bhure Lal)
Chairman, EPCA**

Central Pollution Control Board

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EPCA Report no. 73

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

Report of assessment of Pollution Under Control (PUC) Programme in Delhi and NCR: Recommendations for improvement to ensure pollution from in-use vehicles is under control

This is the final report on the Assessment of Pollution Under Control (PUC) programme. A draft report, with recommendations, was sent to state transport departments and all members of EPCA, including SIAM on March 15, 2017. Comments received from them have been incorporated as discussed. All comments have been included in the footnotes so that there is complete transparency about the deliberations. The comments have also been annexed.

Environment Pollution (Prevention and Control) Authority
for Delhi NCR

April 24, 2017

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1. Directive of the Hon'ble Supreme Court

The Hon'ble Supreme Court in its orders dated January 17, 2017 and February 6, 2017 directed the Environment Pollution (Prevention and Control) Authority for Delhi NCR (EPCA) to inspect Pollution Under Control (PUC) Centers located in the NCT of Delhi and also those in the districts of the NCR. The court has directed EPCA to submit the status report by mid-March, 2017. The directives from the Hon'ble Supreme Court are as follow:

Hon'ble SC order dated January 17, 2017:

"We expect a final, proper and accurate response with regard to the functioning of the PUC centres after a thorough inspection of each one of them. We are told by the learned amicus curiae that the inspection will take about eight weeks."

Hon'ble SC order dated February 6, 2017:

"It has been brought to our notice that earlier an order was passed by this Court on December 2, 2016 and November 25, 2016 relating to setting up of Pollution Under Control Certificate (PUC) centres in Delhi. We request the EPCA to expand the scope of its study by including PUC Centres not only in Delhi but also in NCR and submit a status report, as earlier directed, by mid-March, 2017."

Subsequently, EPCA sought more time from the Hon'ble Supreme Court to complete *this report*. The Hon'ble Supreme Court dated April 7, 2017 stated:

"A letter dated 4th April, 2017 has been received by the Environment Pollution (Prevention & Control) Authority requesting for extension of time for filing report on functioning of PUC Centres in Delhi-NCR till 15th April, 2017. Time, as prayed for, is granted. List the application along with the report filed by EPCA on 28th April, 2017."

In response to the directives from the Hon'ble Supreme Court, EPCA has carried out physical inspection of PUC centres and reviewed the effectiveness of the programme to chart the roadmap for improvement of the vehicle inspection programme.

The inspection has been done by selecting stratified samples from Delhi and districts of NCR. EPCA has not inspected every station, as its initial sampling found that the problem was systemic and endemic to the entire Pollution Under Control (PUC) programme. It was then decided that it would be best to do stratified sampling of the stations and to work on the recommendations for improvement in the system. It is clear that PUC is an integral and essential part of the pollution management system and if it functions well it can ensure that vehicles on-road emit as little as possible in their lifetime.

2. Scope and objective of the review and inspection

i. Physical inspection of the PUC centres to check if credible, authentic and reliable tests are being conducted to identify gross polluters. As per the directive of the Hon'ble Supreme Court EPCA has formed several teams of volunteers who were trained by the officials of the Central Pollution Control Board, to carry out the physical survey. The teams visited and audited the randomly selected PUC centres in Delhi and selected cities and towns of NCR. It may be noted that random centres were selected and surveyed in Delhi and NCR for a diagnostic assessment to understand what ails the system. There are 971 PUC centres in Delhi alone and several hundred in NCR towns that are located in small sheds in petrol pumps. The effort was to understand the systemic improvement needed to make the programme effective.

The teams have audited the centers on the basis of a "Code of Practice" prepared by the ARAI (Automobile Research Association of India) (Annexure 3) with some additional questions. PUC centres were randomly selected to find answers to critical questions related to the effectiveness of the programme. The physical inspection helped gather information on whether test operators are following the correct test procedures; whether the operators have all the requisite test equipment and accessories; data logging procedure and performance of software; level of knowledge of test operators and their compliance with the regular calibration of equipment. Several questions emerging from the field were also followed up with the Regional Transport Offices (RTOs). (See Table 1 on the basic details of PUC centres inspected by EPCA in NCR cities).

ii. Assess the level of compliance with the programme: It is important to understand how many vehicles actually turn up for regular PUC tests to comply with the programme; how many vehicles pass or fail the tests; and their emissions concentration vis a vis the PUC norms. Functioning of the PUC centres have direct bearing on these factors. EPCA has obtained PUC emissions databases from some of the transport departments of the state governments in the NCR region for this purpose. The available dataset has been analysed to understand the effectiveness of the programme.

iii. Evaluation of the PUC emissions databases to assess their usability for enforcement and monitoring. EPCA has analysed the emissions database – actual results from the PUC centres -- that was shared by the state governments. This has been done to assess if PUC centres follow robust protocol for data recording and data management to help in auditing of the PUC centres and also to provide feedback for upgrades of the programme. In fact, poor quality of PUC data bases has restricted the scope of this assessment. This requires immediate improvement.

iv. Adequacy of PUC norms for vehicles with different technologies meeting different mass emissions standards was assessed: Only physical survey of PUC centres and testing methods will be of limited value if adequacy of PUC norms to identify a robust number of gross polluters is not assessed.¹ Actual emission concentration data from PUC testing reported by the state governments was analysed to check the actual pollution performance of different genre of vehicles on roads and compare them with the PUC norms. While this has helped to understand the rate of pass and fail it has also helped to assess the adequacy of the current norms in identifying significant number of highly polluting vehicles on roads and if they possess the level of vehicle technology meeting different mass emissions standards of Bharat Stage I, II, III, and IV. This assessment has been done for the norms for petrol as well as diesel vehicles to understand the kind of revision that is needed.

v. Assessment of official system of inspection and licensing of PUC centres for quality control and to ensure credible and authentic tests are being conducted. Only setting up numerous small centres without proper supervision and without the ability to do good quality control and effective oversight

¹ SIAM submission to EPCA has mentioned that the report is focussing on the need to tighten the PUC norms, whereas the focus has to be more on the implementation of the norm. It must be recognized that implementation of the already notified norms is a bigger problem.

and auditing of the centres can compromise the effectiveness of the programme. The effort has been to see if there is administrative capacity to manage, supervise and audit such numerous decentralized small centres. The large number of PUC centres is a big problem.

vi. Addressed the issue of integrating advanced techniques of on-board monitoring systems in vehicles with the PUC programme and also implement compliance strategies related to manufacturing defects that cause emissions in on-road vehicles: EPCA has also assessed the ways to further upgrade the current on-road emissions monitoring from vehicles by taking advantage of the new systems and legal provisions already made by Ministry of Road Transport and Highways (MoRTH). These include requirement of on board diagnostic systems in all BSIV vehicles that is an inbuilt capacity in vehicles to record any malfunction related to emissions and others. Also the new provision in the newly amended Motor Vehicles Act on emissions recall programme. This will require finding inherent manufacturing defect that cause high emissions for which consumer is not responsible. But manufacturers will be held responsible for repairing the defects. Now strategies are needed to implement these systems and provisions.

vii. Addressed the preparedness for implementing new systems for monitoring on-road emissions from new generation BS-VI vehicles: EPCA has taken into consideration the fact that since the last report on PUC programme that was submitted to the Hon'ble Court in 2003 the vehicle technologies have undergone substantial changes due to improvement in mass emissions standards. Significantly more advanced emissions control systems are expected in the BSVI vehicles from 2020 onwards. This will require a very different approach to on-road emissions monitoring. The notification of the Ministry of Road Transport and Highways (MoRTH) on BSVI emissions standards has already provided for Real Driving Emissions monitoring that is measuring emissions while vehicles are being driven. This is a very important change that has been brought about globally after it was found in Europe that Euro VI vehicles emitting significantly more than their certification level. Hence this advancement in real emissions monitoring to ensure that the emissions control technologies in vehicles performs optimally during vehicles' lifetime.

Such monitoring is not possible within the framework of the current PUC programme. Immediate steps are needed to put in place the new systems and protocol for the new monitoring systems to be prepared for 2020. SIAM, in its submission to EPCA has mentioned that real driving conditions are not within the scope of the PUC assessment.² But given the fact that fundamentally different real driving monitoring systems will have to be implemented within three years, it is emphasized that the roadmap for real driving emissions monitoring should be in place from 2020.

² SIAM, in its submission to EPCA has mentioned this with regard to the reference to Real Driving Emissions Test Procedures, which has been notified by the government of India for introduction, after BSVI emissions norms are implemented. SIAM would like to highlight that these tests are done on new vehicles for type approval purpose and these tests cannot be done by the PUC centres. Hence reference to Real Driving Emissions in various sections needs to be removed, as it would not be in the scope of the PUC testing.

3. Summary of observation of EPCA based on the review and physical inspection of PUC centres

This report has detailed out the key findings of the review and assessment. The summary observations are as follow.

Problem of quality control and assurance: The overall assessment has revealed that there are serious quality concerns in the way PUC tests are conducted and equipment are maintained in numerous PUC centres across the NCR region. Malpractice is evident and noticeable. One of the reasons for this is the way PUC centres are organized. These centres are numerous, small and decentralized with very weak regulatory oversight. It is very difficult to inspect and monitor all of them. In Delhi alone there are 971 centres but the transport department has only 28 inspectors and among them only one inspector is available for actual on ground inspection of so many stations. In NCR towns the number of inspectors varies between two to nine whereas PUC centres are in two digits to more than 100 in one town. Thus, only tinkering with the current system is not the full solutions. Over a period of time small steps have been taken in Delhi to improve the system with some results but it continues to remain plagued with problems. This needs more systemic solutions are needed.

EPCA notes with serious concern rampant cheating and malpractices that have been reported by the inspection team in PUC centres in the region. This includes use of fake software, issue of false passes and inappropriate tests (*Annexure 2 & 9*). Details of these malpractices have been included in the main report. In fact, out of 13.7 lakh emissions data that have been analysed for Delhi nearly 20 per cent of tests have recorded zero values. Zero values of carbon-monoxide (CO) and hydrocarbon (HC) can be negligible in many new vehicles. But sensitivity of instrument (lowest value that it can record) should be verified in case any PUC centre reports many zero values.

This casts serious doubts on the efficacy of the programme and the licensing system. Unless this programme is fully re-engineered this can deteriorate into uselessness.

Poor data recording and reporting: Access to PUC emissions data is very difficult especially in NCR where data recording is manual. Moreover, data recording and reporting does not have a uniform format which makes data retrieval and usage for analysis very difficult. For the purpose of this EPCA study the transport departments of different NCR states have compiled a limited set of data base according to the format given by EPCA. Only in Delhi the PUC data recording is online and automatic linked with central server with uniform standardised software. This has minimized manual interference with test results. But even with the online system, data procurement in standardized format has been challenging in Delhi making it difficult to analyse the data to understand the compliance level. It has not been easy to get disaggregated data by vehicle types, fuel types, or by manufacturing date to know the generation of mass emissions standards etc. Initially the data was garbled and unreadable. It may be noted that despite huge investments in the online and automatic system in Delhi its accessibility and usability for monitoring purpose has remained poor. This requires immediate attention. Cities with manual monitoring system have no centralised database to allow regular analysis to inform the system.

Poor compliance with the programme: This analysis has once again revealed that the transport departments do not have clear information on how many vehicles turn up for tests. An indicative assessment for this report based on the data on total number of tests carried out in one quarter in Delhi shows perhaps just about 23 per cent of vehicles have turned up for tests. This needs a very strong tracking as well as a solution to ensure 100 per cent compliance. This is a poorly enforced programme.

Poor failure rate – nearly all vehicle pass: Even among those vehicles that turn up for tests the failure rate is very low – in Delhi only 1.68 per cent of diesel vehicles fail the smoke density tests and about 4.5 per cent of the petrol vehicles fail the CO and HC tests. Thus, this programme is not even designed to catch 15 to 20 per cent most grossly polluting vehicles in the fleet.

One serious flaw is the fact that failed tests are often not recorded as vehicle owners refuse to pay the test fee if their vehicles fail. As a result, the pass - fail data compiled by the transport departments show very low failure rate. Lax norms and malpractice also contribute to this trend. It is therefore, important to mandate advance payment of fees before the test is conducted and the software should be changed accordingly to plug this loophole.

Lax PUC norms: Poor failure rate is not only a reflection of poorly done tests and poor data keeping; It is also a reflection of very lax PUC norms that rarely fail the vehicles. EPCA notes with great concern that the current PUC norms are very weak especially for the pre BS-IV vehicles that dominate the fleet in our cities. Not only most vehicles pass the test but a great many of them actually pass the test with as high as 80 per cent margin from the norm. This calls for immediate tightening of the PUC norms particularly for the pre BS-IV vehicles. Comparatively, the tests prescribed for petrol vehicles are more evolved and complex (petrol vehicles are tested for CO, HC and lamda which is air to fuel ratio) as against tests for diesel vehicles.

In diesel vehicles, the one and only test is smoke density test. In 2004 MoRTH had modified the smoke density test procedures in 2004 to introduce two additional test parameters for diesel smoke density test which is measurement of engine speed in RPM (Revolutions Per Minute) to ensure required acceleration at the time of testing and also oil temperature tests to ensure warmed up engines for tests. Subsequently, on June 16, 2015 the rules were amended by MoRTH to simplify the test. Oil temperature test was removed. If a vehicle was able to pass the smoke density test in a cold state when emissions are high it implies that the smoke density emissions will be lower if the engine is in a sufficiently warmed up state. This now requires that a vehicle which does not meet the norm in cold state can be retested with the engine oil temperature having attained 60 degree centigrade, signifying a warmed up engine.

Smoke density tests were originally designed for old diesel technologies that had high visible smoke emissions. But with advancement in engine technologies smoke has disappeared but diesel vehicles have high invisible emissions of tiny particles that are extremely harmful and cannot be captured through the current smoke tests. EPCA's view on the matter is that strengthening of the emission norms and test procedures are needed in addition to ensuring a greater level of compliance in terms of universal PUC coverage. Together, both these approaches were needed to strengthen the in-use vehicular emission control regime and improve the air quality.

Current smoke density test for diesel vehicles ineffectual – need tightening of norms and upgradation of test procedures to address particulate pollution: Review of the scientific evidences from global experience shows that smoke density is not a good proxy for particulate emissions from diesel vehicles. Less smoke does not mean less particulate emissions that are very hazardous. With engine upgrades engine smoke disappears and high particulate emissions remain invisible. Currently, direct testing of particulate emissions from on-road diesel vehicles is difficult and is only emerging. But as is happening globally, smoke density norms are being tightened and the tests are being upgraded to be conducted on rollers to put load on vehicles while testing the smoke. This makes the test relatively more effective. This will have to be reviewed immediately and be phased-in first for the commercial vehicles.

As it is not immediately possible to measure exhaust emissions of particulate matter and nitrogen oxide from diesel vehicles (key pollutants of concern) within the PUC system, MoRTH should review the possibility of including these measurements in advanced inspection centres³. Such monitoring will require different set of advanced equipment that can only be introduced in big centralized and automated emissions testing centres.

Legal framework for monitoring PUC centres weak: The rapid survey has shown ill-maintained equipment, lack of documentation on calibration of equipment, poorly done tests, lack of standardized

³ Central Pollution Control Board has raised the question in the EPCA meeting to discuss this report on April 19, 2017, if smoke is not a good proxy for particulate matter emissions and if nitrogen oxide is also a concern why those pollutants cannot be monitored. The clarification has been included here.

software in testing equipment in the NCR, and wide malpractice and fake certificates that have seriously compromised the effectiveness of the programme.⁴The investigation has brought out some of these malpractices through decoy operations. Physical inspection has revealed how emissions testing probes are not even inserted in the exhaust pipe, or how it remains unconnected with the computers at the time of testing etc to generate false passes. For quality control, the PUC centres are required to display type approval certificate for equipment, operator training certificate, calibration report etc. Some of the centres inspected were found defaulting on these grounds. Depending on the irregularities departments are either expected to issue warning, or show cause notice or cancel license. But effective implementation of these requirements is not uniformly stringent across the NCR. The entire NCR requires a standardized protocol for monitoring and management of the PUC centres is required.

Concerns about skills of operators: There is lack of skilled and trained personnel in PUC centres. The two-three days training imparted by equipment manufacturers is found to be very inadequate. Staff turn-over is high. Training is also imparted to those who are not regular operators. There is no evidence of PUC centres training back up personnel.

Decentralised testing centres vs centralized testing: It is quite clear that the large numbers of decentralized PUC centres across NCR without a robust framework for quality control need a re-think. To make this system work city governments require exceptional administrative capacity for enforcement. This is seriously compromising the effectiveness of the programme. Merely allowing further expansion of and investment in the current decentralized poorly monitored PUC centres will only create entrenched business interest in a weak programme. Therefore, strategic phase-in plan for big centralised emissions testing centres that are fully automatic and eliminate manual interference, and are capable of conducting high volume of emissions tests should be implemented for commercial vehicles first. This will also help to upgrade the emission testing system and procedures that is not possible in small centres. Such systems can be first phased in for the commercial vehicles in the NCR and subsequently extended to other priority vehicle segment.

Need to integrate already in-built in vehicle monitoring system with vehicle inspection programme: EPCA would like to emphasise that all new BSIV compliant vehicles since 2010 have come equipped with on-board diagnostic system (OBD) that were further upgraded in 2013. The OBD system stores important information about any detected malfunction in vehicles so that a repair technician can accurately find and fix the problem. This identifies emission-related components covered under warranty. Fault codes and other scan tool data give information about area of malfunction or a specific component. This helps with early detection of malfunctions. Globally, this tool is being integrated with vehicle inspection and maintenance programme. In addition to the physical check the information from vehicle can be scanned and acted upon. MoRTH needs to develop protocol for the integration of OBD with vehicle inspection programme in state transport departments.

Need to upgrade in-use emissions monitoring programme for the new generation vehicles to come with Euro VI emissions standards in 2020: Any assessment and overhaul of vehicle inspection programme at this juncture will remain incomplete and inconsequential if strategies to address the on road emissions from new generation vehicles with advanced emissions control systems like the particulate trap etc are not prepared and implemented now. Current basic PUC emissions tests will not be able to address these technologies of BSVI that will be implemented in 2020. Immediate steps will have to be taken to plan the system for enforcement of new rules for in-use emissions compliance based on real driving emissions testing already notified by the MoRTH. Interestingly, while conducting this rapid survey of PUC programme, the PUC operators pointed out that hybrid car models that are already come on road, cannot be tested under the current PUC regime. But they turn up for tests as this is a legal requirement. This has been cited only to illustrate the point that new genre of technologies will require different test regime.

⁴ SIAM in its submission to the EPCA has mentioned that – as rightly pointed out in the report, controlling proliferation of fake software, lack of required equipment and facilities, lack of qualified and skilled PUC operators, are issues directly linked to PUC operations and needs to be addressed at the earliest.

It is more important to re-emphasise that the Euro VI vehicles arriving in three years will have different in-use monitoring requirement. The Euro VI notification of the MoRTH has provided for real-world driving emissions test procedures and standards – real emissions to be monitored while vehicles are moving on the road. This now requires a clear implementation strategies and systems in place as BS-VI vehicles begin to be registered and sold by April 2020.

4. Summary recommendations of EPCA

EPCA concludes that without a robust system of emissions monitoring and compliance, the investments in emission monitoring of on-road vehicles as well as advanced emissions control systems in new vehicles to meet tighter emissions standards, can go waste and negate air pollution control efforts in our cities. Management of emissions from on-road vehicles will require an integrated approach to ensure all generations of vehicles – old and new remain low emitting for as long as the vehicles are on the road.

This will require strengthening of the PUC systems for all on-road vehicles – Bharat stage (BS) I to IV generations of vehicles combining both physical tests as well as OBD tests. This will also require appropriate emissions monitoring system for the new generation of BSVI vehicles to come within three years. PUC will not be the relevant programme for that genre of vehicles. The BSVI standards and regulations have already provided for real driving emissions testing when vehicles move on the road. But the roadmap for its implementation needs to be charted quickly to allow Delhi and NCR to be prepared in time.

Simultaneously, the newly amended Motor Vehicle Act and Rules has given the opportunity to implement emissions recall programme so that the vehicle manufacturers can be held responsible for any manufacturing defect that increase on-road emissions. Both EPCA and Auto Fuel Policy committee had recommended emissions recall programme in 2003. Thus, addressing all the three element of the programme – PUC – both physical testing and OBD testing; real driving emissions testing for in-use compliance; and manufacturer responsibility for manufacturing defects, are the critical steps to get a robust system to keep vehicles low emitting on roads. This is needed for both consumers as well as manufacturers' responsibility. In view of this the following recommendations are made:

1. Limit the numbers of PUC centres, upgrade them and bring them under strong supervision and quality control:

The current practice of allowing mushrooming of small time and numerous PUC centres in refueling stations across the NCR must be stopped. It is more important to limit their numbers, upgrade their capacity to carry out proper credible and authentic testing and bring them within a strong accountability framework.

2. For improving compliance with the PUC programme, MoRTH and state transport departments should do the following:

2.1. Ensure 100 per cent compliance by linking annual vehicle insurance with PUC certificates.

Annual vehicle insurance cannot be obtained without all the requisite PUC certificates. Currently, PUC certificates need to be obtained every quarter in Delhi and every six months in the NCR. This periodicity of PUC certification can be made uniform across Delhi and NCR later only after PUC norms and oversight systems have been adequately upgraded and made stringent. Issue of authentic certificates must be ensured based on authentic and credible tests.⁵

2.2. Introduce automatic online network for transmission of PUC data to the central server to minimize manual interference and allow proper analysis of data for remote auditing of PUC centres. Adopt uniform and standardized data recording and reporting format and uniform software across Delhi NCR.⁶ Mandate periodic analysis of data to refine enforcement and for monitoring and submission of

⁵ The transport department, Govt. Of Rajasthan has suggested inclusion of security features such as QR codes for PUC stickers and water marks for determining authenticity of such certificates. It has also suggested an integrated QR Code and SMS based system to determine the PUC history of a vehicle.

⁶ The Transport Department of NCT Delhi in its submission to the EPCA has mentioned that – As EPCA proposed uniform common format for PUC data recording and reporting for both manual and automatic data recording system, common and uniform format may be made by MORTH, GOI, as it has prescribed the form and procedures.

compliance report every six months. Software used in different make of testing equipment across NCR needs to be standardized to prevent fake values. MoRTH needs to develop the standardized protocol for uniform application across Delhi-NCR.

2.3. Mandate pre-payment of PUC fees before the tests are conducted⁷. No test should be conducted without taking the fee in advance. The software should be modified accordingly.

2.4. Strengthen inspection of the PUC centres for quality control and strengthen the licensing programme to ensure proper calibration, authentic tests; annual maintenance contact for the maintenance of all testing equipment and accessories; training of operators, calibration of equipment etc are carried out. Make quality audit of centres and calibration quarterly. Introduce annual third party inspection of PUC centres immediately. State Pollution Control Boards with guidance from Central Pollution Control Board should coordinate this.

2.5 Phase in big centralized emissions testing centres capable of conducting automatic and upgraded tests for commercial vehicles on a priority basis. Delhi already has Burari vehicle inspection and fitness centre in Delhi for commercial vehicles. The commercial vehicles visit it for annual vehicle fitness and roadworthiness tests. This needs to be upgraded for high level of automatic emissions testing so that operators and vehicle drivers do not come in contact to influence the test results and credible and upgraded tests are conducted. MoRTH is also setting up centralised inspection centres in NCR as in Rohtak. These should be aligned to firm up the roadmap. Add more such centres as needed.

2.6. Introduce well equipped mobile test centres and a programme to check visibly polluting vehicles: In addition to stationery testing centres, mobile units are also needed for surprise checks as well as to catch the visibly polluting vehicles on road. There should be appropriate penalty for visibly polluting vehicles.

Enforce stringent penalty for PUC centres for non-compliance and malpractices.

3. For improving the effectiveness of the PUC tests and inspection, MoRTH should do the following:

3.1. Tighten the PUC emissions norms for pre-Bharat Stage IV vehicles: Analysis of large data set on actual emissions concentration tested in large number of PUC centres in Delhi and UP has also brought out that the actual observed emissions values of pre-Bharat Stage IV vehicles are significantly lower than their prescribed norms. In most cases 80 per cent lower than the limits. These norms cannot identify at least 15 to 20 per cent grossly polluting vehicles in the on-road fleet. Nearly all vehicles pass the tests. Due to poor recording of failed tests and due to very lax norms the overall failure rate in Delhi is 4.69 per cent. For the diesel vehicles tested, the failure rate stands at 1.68 per cent, compared to 5.18 per cent for petrol vehicles and 4.65 per cent for all other fuel categories requires urgent attention and action. In UP NCR cities, the overall failure rate is abysmally low, at 0.49 per cent – 0.39 per cent in two-wheelers and 0.59 per cent in four wheelers. The MoRTH needs to tighten the PUC standards for the pre-Bharat Stage IV emissions standards.⁸ This will also help to weed out very old non-compliant vehicles and speed up fleet renewal based on improved standards.

3.2. Overhaul emissions tests and tighten norms for diesel vehicles: The review of available data shows that the smoke density test – the only test that is carried out in diesel vehicles is very lax for the pre-Bharat Stage IV diesel vehicles. More than 80 per cent of vehicles tested show smoke density levels that are below the norm prescribed for the Bharat Stage IV vehicles. Therefore, the current norms for Bharat Stage IV norms should be made uniform for the pre-Bharat Stage IV vehicles as well. This can be further

⁷ The Transport Department of NCT Delhi in its submission to the EPCA has mentioned – Mandate pre-payment of PUC fees before tests are conducted.

⁸ The Transport Department of NCT Delhi in its submission to the EPCA has mentioned that – regarding poor failure rate, emissions standards may be tightened by the MORTH, GOI, as proposed by EPCA. For diesel vehicles prescribed emissions standards should be uniform for pre Bharat Stage IV and for Bharat Stage IV both and proposed by EPCA for further tightening to 40 HSU (Hartridge Smoke Unit). It comes under the purview of MORTH, GOI.

tightened to 40 HSU⁹ (Hartridge Smoke Unit) which is the global best practice. Tighter norms will help to weed out the very old and polluting vehicles and speed up fleet renewal.

Moreover, as explained earlier globally smoke tests are being upgraded with more advanced test procedures to make these tests more rigorous and effective. MoRTH may review those advanced testing procedures and provide a roadmap for the introduction of these tests in the large centralized testing centres for commercial vehicles quickly.

3.3. Make lambda test for petrol cars mandatory across NCR: Lambda testing for petrol cars equipped with three way catalytic converters – introduced in BSII-III level is already mandatory in Delhi as per the MORTH 2004 notification, but not in NCR. Lambda value represents the air to fuel ratio. It is important to maintain the optimum ratio for proper functioning of the catalytic converters that play a crucial role in cleaning up the exhaust gases from petrol cars. It is not possible to directly test the efficacy of the catalytic converters. That is why it is important to ensure that the operative systems in the vehicles needed for its optimum performance are maintained. Lambda is an indicator of that. Such tests will require upgradation of the test equipment from two gas analysers to four gas analyzers capable of doing lambda testing. Petrol cars are already tested for carbon monoxide, hydrocarbon based on two speeds. If done along with lambda measurement, the test procedures for petrol cars can become more robust and effective. As the MoRTH has already provided for lambda tests in its 2004 notification, the concerned state governments need to issue orders for implementation in the NCR.

3.4. Integrate OBD with inspection and maintenance programme: The MoRTH needs to develop the protocol for implementation of OBD for vehicle inspection programme that will be implemented by the state governments. This will complement the physical testing.¹⁰ It is also important to detail out how this will be operationalised at the ground level and how the transport department will implement this programme.

3.5. Detail out the strategy for advanced real driving emissions monitoring of new generation vehicles to come with BSVI emissions standards in 2020: Any roadmap for improving vehicle inspection programme at this juncture will have to keep in view the dramatic transition in emissions control technologies within a short span of three years when BSVI emissions standards will be enforced. The current PUC is not designed to address those vehicle technologies. The notification of MoRTH on BSVI standards has already provided for the introduction of Real Driving Emissions Test Procedures and Standards based on portable emissions monitoring system to monitor emissions as vehicles move on the road. This is needed to ensure that all the advanced emissions control devices that to be fitted in the new vehicles will continue to perform effectively in real world conditions.

This has become necessary in view of the rapid deterioration in emissions noted in new Euro VI vehicles in Europe and the US and also to prevent use of defeat devices to cheat emissions standards. The data available from Europe shows that the actual NOx emissions from Euro VI diesel cars can be as bad or worse than a Euro I diesel car as on-road emissions can be as higher as upto 16 times higher than their certification level (see Graph 1: NOx emissions from Euro-VI diesel cars on road in Europe are emitting several times higher than certification level). EPCA strongly believes that as India is now making this crucial transition to a very advanced genre of vehicles proactive and preventive policies and systems should be put in place to these advanced systems continue to perform efficiently on road and for

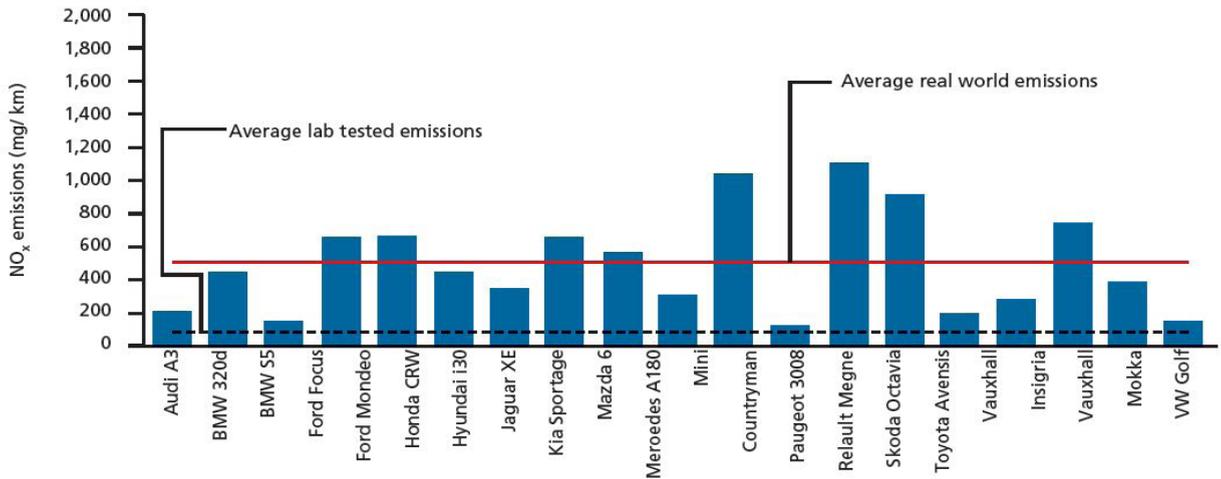
9 SIAM has mentioned in the meeting held on April 19, 2017 that 40 HSU for all diesel vehicles may not be appropriate as some of the older vehicles were not designed to meet this level. However, EPCA is of the view that standards should be stringent enough to identify and weed out the old and gross polluters. This will also help with rapid fleet renewal. Also Government of India is framing a scrappage policy for the old commercial vehicles that will further help to eliminate very old and polluting vehicles. It is also important to label the vehicles according to the mass emissions standards especially the older vehicles. This will subsequently help to regulate the older and polluting vehicles better.

10 Department of Transport NCT Delhi in its submission to EPCA has stated that regarding integrated OBD with inspection and maintenance programme, Ministry of Road Transport and Highways, Government of India, need to develop the protocol for implementation of OBD for vehicle inspection.

emissions to all generation of vehicles remain low emitting during their useful lifetime.¹¹ MoRTH along with the state governments of the NCR-Delhi need to put in place the systems for introduction of Real Driving Emissions testing for BSVI vehicles.

Graph 1: NOx emissions from Euro-VI diesel cars on road in Europe are several times higher than certification level

Continues to exceed norms by several times



Source: Secretary of State Transport, UK

Implement emissions recall programme to make vehicle manufacturers responsible for manufacturing defects and introduce regulations to prevent use of cheat and defeat devices to reduce emissions on road

¹¹ Department of Transport NCT Delhi in its submission to EPCA has stated that regarding to introduction of Euro VI emissions standards in 2020 and requires introduction of Real Driving Emissions Test Procedures and Standards based on portable emissions monitoring as vehicles move on the road comes under the purview of the MORTH, GOI.

Table 1: Salient features of physical inspection of PUC centres in Delhi and NCR

Cities in NCR	Total number of PUC centres		Data submitted to EPCA by state governments	Number of inspectors with state transport departments	Number of centres inspected by the EPCA team	Periodicity of PUC tests required in cities of NCR
	Automatic and availability of central server and network	Manual				
Delhi						
	971 (Transport department has 28 inspectors)	Nil	Emissions test data given for all 971 PUC centres from November 1, 2016 to January 31, 2017 including number of vehicle tested by fuel type; Pass and Fail data; Date and Time of testing; Emissions data for CO, HC, CO ₂ , O ₂ , and lambda for petrol vehicles and smoke density and RPM data for diesel vehicles. But most of the data came garbled and not in usable format. In addition, crucial data points such as type of vehicle and year of vehicle manufacture was missing, in spite of being collected at the PUC Centres.	28	Total 28 Diesel 13 Petrol 15 Centres 15 (centre codes for petrol and diesel are separately allotted.)	3 months for pre BS IV and one year for BSIV
Haryana						
Gurugram	Nil	127	Emissions test data given for 25 PUC centres including number Vehicles; Pass and Fail result; Date and Time Fuel type	3 (Data reported every month)	09	6 months for pre BS IV and one year for BSIV
Faridabad	Nil	57	No data given for any PUC centres. Information from field investigation.	(Data submitted every month)	5	
Rohtak	Nil	50+	No data given for any PUC centres. Information from field investigation.	3	10	
Jhajjar	Nil	3	Data give for all 3 stations including number of Vehicles; Pass and Fail result; Date and Time of testing; by fuel type		Nil	

Uttar Pradesh						
Ghaziabad	Nil	114	Data given for all 30 stations including number of Vehicles; Pass and Fail result; Date and Time of testing, by fuel type, vehicle type, year of manufacture and tested emission values for CO, HC, CO2, NOx, O2, lambda and RPM	9	10	6 months for pre BS IV and one year for BSIV
Gautam Budh Nagar	Nil	104	Data given for all 29 stations including number of Vehicles; Pass and Fail result; Date and Time of testing, by fuel type, vehicle type, year of manufacture and tested emission valuesfor CO, HC, CO2, NOx, O2, lambda and RPM	7	5	
Bulandshahr	Nil	48	No data given for any PUC centres. Information from field investigation.	2	10	
Baghpat	Nil	8	Data given for 7 stations including number of Vehicles; Pass and Fail result; Date and Time of testing, by fuel type, vehicle type, year of manufacture and tested emission valuesfor CO, HC, CO2, NOx, O2, lambda and RPM		Nil	6 months for pre BS IV and one year for BSIV
Shamli	Nil	10	Data given for 5 stations including number of Vehicles; Pass and Fail result; Date and Time of testing, by fuel type, vehicle type, year of manufacture and tested emission valuesfor CO, HC, CO2, NOx, O2, lambda and RPM		Nil	
Muzaffarnagar	Nil	18	Data given for 13 stations including number of Vehicles; Pass and Fail result; Date and Time of testing, by fuel type, vehicle type, year of manufacture and tested emission valuesfor CO, HC, CO2, NOx, O2, lambda and RPM		Nil	
Meerut	Nil	76	Data given for 5 stations including number of Vehicles; Pass and Fail result; Date and Time of testing, by fuel type, vehicle type, year of manufacture and tested emission valuesfor CO, HC, CO2, NOx, O2, lambda and RPM		Nil	
Hapur	Nil	27	Data given for 19 stations including number of Vehicles; Pass and Fail result; Date and Time of testing, by fuel type, vehicle type, year of manufacture and tested emission valuesfor CO, HC, CO2, NOx, O2, lambda and RPM		Nil	

Rajasthan						
Bharatpur	Nil	41 + 6 (Mobile Centers) 86 centers under jurisdiction from satellite towns	Data has been submitted	10	6	6 months for pre BS IV and one year for BSIV
Alwar	Nil	28	Data provided limited to no. of vehicles tested in Dec, Jan and Feb 2017		5	

5. Detailed findings of the assessment and physical audit of PUC centres

I. Problem with PUC data reporting (manual as well as automatic)

While a multitude of PUC tests are being carried out in thousands of centres across the NCR, data keeping, collation and reporting are very poor. This does not allow proper analysis and auditing to inform enforcement and monitoring.

Delhi is the only city in the NCR that has invested heavily in networking all PUC centres for automatic recording of all emissions tests results in the central server. This has been done to minimize manipulation of results by PUC operator as the test results are automatically transferred to the central server called Paryavaran Mitra as soon as the test is done. Such a facility also allows periodic analysis to see if anomalous data is emerging indicating malpractice. This also helps to audit PUC centres remotely and give an idea about the level of compliance.

But the PUC data submitted by the Delhi transport department indicates that proper data protocol has not been maintained and the data is not easily accessible with adequate detail to allow proper analysis. It mostly gives the gross data in terms of pass and fail. In fact, Delhi Transport Department had to be persuaded thrice to submit data according to the format of EPCA. Properly disaggregated data related to vintage of vehicles in terms of adherence to BSIV, BSIII or BS II and older emission standards; age or manufacturing date of vehicles, or vehicle category wise data was not available. In spite of there being a huge investment to collect these fields of data at the level of the PUC centre, this data is not recorded properly in the centralized server due to mismanagement of the software. Most of the data came clubbed for both cars and two-wheelers in Delhi. Diesel vehicle data was very inadequate and garbled. In the excel sheet "HSU" (Hartridge Smoke Unit) and "K mean" values of diesel vehicles were garbled and could not be analysed. Whatever data could be retrieved manually for diesel vehicles was analysed. It is unfortunate that despite such huge investment in automatic online system for PUC data reporting its usability was so poor (see Figure 1 and Figure 2). Data reporting will have to be improved immediately so that this investment does not become wasteful.

Figure 1: Snapshot of Paryavaran Mitra – Centralised PUC Data of the Transport Department of Delhi

S.No	Date	Petrol	Diesel	CNG	LPG	Total	Details
1	28-02-2017	10426	1587	3557	3	15608	View
2	27-02-2017	11157	1667	3891	5	16743	View
3	26-02-2017	9798	1210	2575	2	13609	View
4	25-02-2017	10202	1569	3235	3	15048	View
5	24-02-2017	8890	1383	2349	2	12647	View
6	23-02-2017	9579	1387	3039	7	14036	View
7	22-02-2017	9773	1586	3328	2	14717	View
8	21-02-2017	9792	1471	3306	6	14622	View
9	20-02-2017	9892	1340	3064	1	14317	View
10	19-02-2017	9892	1133	2515	3	13573	View
11	18-02-2017	10716	1475	3158	6	15376	View

S.No	Time	Vehicle No.	Fuel Type	Certificate No	Status
1	07:56:29	DL8SBA1270	PETROL	P483013533	Pass
2	07:38:35	DL9CF0834	PETROL	P637009452	Pass
3	12:03:43	DL1M2862	Diesel	D341001552	Pass
4	12:26:50	HR55U2238	Diesel	D161014643	Pass
5	12:30:51	DL1GC1244	Diesel	D220006802	Pass
6	12:45:07	HR38P9453	Diesel	D161014644	Pass
7	12:56:26	HR55R2823	Diesel	D161014645	Pass
8	01:35:52	NL01K9863	Diesel	D058004883	Pass
9	01:44:41	DL1GC5285	Diesel	D161014646	Pass
10	01:57:23	HR55F2865	Diesel	D058004884	Pass
11	02:09:43	HR55L6123	Diesel	D161014647	Pass

Source: <http://pucc.delhi.gov.in/PuccReport/certificateDownloaded#>

Figure 2: Snapshot of Excel sheet PUC data sheet provided by Transport Department of Delhi

PUC NO	Vehicle Number	Fuel	Status	Date	Time	CO	HC	CO2	NOX	O2	Lymmmda	RPM
P567042170	DL1RM2059	PETROL/C	Pass	3/11/2016	10:41:12 AM	0	18	0	null	20.87	0	0
P582031650	HR26CM6528	PETROL	Pass	1/11/2016	7:56:56 AM	1.57	250	2.9	null	14.72	3.048	0
P570015236	DL3CAK6422	PETROL	Pass	1/11/2016	8:14:28 AM	0.41	182	12.6	0.2	0.991	2550	7
P232020667	DL5SAR5812	PETROL	Pass	1/11/2016	9:35:27 AM	0.61	303	4.14	null	10.14	2.313	0
P225055087	DL1RK4854	CNG ONLY	Pass	1/11/2016	9:50:54 AM	0.04	40	0.08	null	21.06	10	13
P675005724	DL3SCX1921	PETROL	Pass	1/11/2016	9:16:58 AM	1.47	852	6	null	0	0.853	450
P794025123	DL13SR3389	PETROL	Pass	1/11/2016	11:18:08 AM	0	133	0.81	null	19.5	-----	0
D040003451	UP17AT4040	Diesel	Pass	1/11/2016	12:21:37 PM	746-2224TGX750-2166-23.3-76-0.61-@749-2151-23.1-76-0.61-@746-2098-21.4-76-0.55-@750-2055-25.5-76-0.68-@TGX23.3-0.61TGX						
P584040692	DL7CE2577	PETROL	Pass	1/11/2016	1:35:10 PM	0.099	65	13.53	0.1	0.999	2494	-----
P444029539	DL8CH3272	PETROL/C	Pass	1/11/2016	1:40:01 PM	0.01	130	0.56	null	19.94	10	0
P307014130	DL5SAL3173	PETROL	Pass	1/11/2016	2:00:11 PM	1.89	138	4.3	7	-----	13.3	1.893
P907000480	DL1PC8758	CNG ONLY	Pass	1/11/2016	3:14:15 PM	0	0	0	-----	20.75	-----	0
P815001925	DL11SB1423	PETROL	Pass	1/11/2016	4:09:19 PM	0.253	1036	12.29	null	0.51	0.909	2657
D187004983	DL2CAL5717	Diesel	Pass	1/11/2016	4:05:57 PM	1610-3672TGX1760-3800-32.1-84-0.90-@2180-3770-31.7-84-0.88-@1240-3900-31.7-84-0.88-@1270-3810-30.2-84-0.83-@TGX00-0.87TGX						
D481000034	DL12CA5166	Diesel	Pass	1/11/2016	4:32:14 PM	822-3700TGX839-3564-8.3-30-0.20-@839-3700-19.0-29-0.49-@839-3700-13.9-30-0.35-@TGX13.7-0.34TGX						
P569012754	DL9SAX3387	PETROL	Pass	1/11/2016	5:19:57 PM	2.058	927	1.88	-----	16.2	-----	0
P060019776	DL3CAK5308	PETROL	Pass	1/11/2016	6:26:29 PM	0.144	18	6.28	0.76	1.071	2592	-----
P709031668	DL7CB4479	PETROL/C	Pass	2/11/2016	9:19:19 AM	0.006	30	0.12	null	20.58	0	0
P225055236	DL6SAE1897	PETROL	Pass	2/11/2016	9:26:09 AM	0.64	708	2.96	null	15.8	3.525	13
P212016419	DL8SAL6142	PETROL	Pass	2/11/2016	10:37:45 AM	0.297	280	1.19	-----	17.48	-----	0
P309016329	DL7SA52167	PETROL	Pass	2/11/2016	11:01:32 AM	0.03	619	1.56	null	0	0.803	11
P271013719	DL1K0808	CNG ONLY	Pass	2/11/2016	11:32:50 AM	0.06	71	9.28	null	2.84	1.2	0
P237022290	DL3CAT0334	PETROL	Pass	2/11/2016	11:33:54 AM	0.122	120	12.74	1.45	1.069	2590	null
P568009988	DL1LQ0896	CNG ONLY	Pass	2/11/2016	12:51:11 PM	0.15	129	9.1	6	-----	0.5	1.022

In other towns of NCR the data keeping is purely manual. Records are maintained on the number of vehicles tested, their registration details and year of manufacture. Actual tested emission levels for both diesel and petrol vehicles are not available in most districts. Unless the transport department makes the effort to compile data on demand it is not at all accessible. Therefore, in this case EPCA had to rely on whatever limited data that the state governments could provide according to the EPCA format. Delhi has provided data from its central server for the period of last three months.

In Uttar Pradesh, even though data keeping is purely manual, the officials of the Department of Transport have made the effort to provide detailed records according to the EPCA format for a limited time period of 10 days. This includes a unique PUC number for every vehicle tested, details on make and model of the vehicle, Vehicle category, vehicle model year (Reg. Date), test date, test time, tested emission levels for CO, HC, CO₂, O₂, RPM, Lambda and Smoke density (including K-mean). Data was recorded on physical registers/sheets of paper, and the authorities started to maintain the necessary records in physical as well as digitized format after the EPCA meeting that was held on this issue in January. Even though it is such a small data set this could be analysed better.

In Haryana the data for some 28 centres located in Gurgaon and Jhajjar was provided. This included vehicle number, date and time of testing, pass and fail results etc. The data provided to EPCA was in hard copy and required manual analysis which was very time consuming. Rajasthan has provided data though on a basic level (number test only). No other details were provided.

EPCA would like to emphasise the importance of proper data keeping and recording as data in itself can expose malpractices. For instance, the analysis of the data from the PUC centres of Uttar Pradesh shows some anomalies indicating malpractice on ground, such as series of vehicles with emission levels exceeding the norms were categorized as "PUC Pass". In several cases, the data is missing in key categories. There is also a pattern in several districts, including Bulandshahr, Hapur and Gautam Buddha Nagar where scores of separate vehicles tested showed exactly the same emission levels. Similarly, in other places, the recorded emission data is exactly the same as the norms. For several two-wheelers tested on the same day, the recorded HC and CO levels were 4500 ppm and 3.5 per cent respectively (which are the norms), irrespective of the make, model and year of manufacture.

Further analysis of Delhi data has shown close to 20 per cent vehicles tested scored zero emission. Zero values of CO and HC in some vehicles can be overlooked. But sensitivity of instrument (lowest value that it can record) should be verified in case any PUC centre reports many zero values.

Even from the interviews with the Regional Transport Offices (RTOs) of Rohtak, Gurugram and Faridabad it has become apparent that PUC data has been collected this time mainly because of EPCA direction. The RTOs neither have a mechanism to collect data nor do they have a scientific precedent of employing such data to improve upon the existing system.

Thus, if authorities ensure proper data keeping and analysis a lot of malpractices can surface just from the data. This allows good remote auditing that can complement physical inspection.

EPCA therefore proposes uniform common format for PUC data recording and reporting for both manual and automatic data recording system. Phase in automatic data recording in the central server and use this for remote auditing of the PUC centres.

II. Level of compliance – how many vehicles turn up for tests

It has not been possible to establish with reliability what proportion of vehicles in the city actually turns up for tests. The state governments do not maintain that record. This is the weakest link in the enforcement mechanism. Periodicity of tests also varies across the NCR. While Delhi requires a PUC test every quarter for pre-BS-IV vehicles and once a year for BS-IV vehicles, the periodicity in Uttar Pradesh is every 6 months. But it has not been possible to assess if all the vehicles actually turn up for the tests.

Even though Delhi has an automatic central server linked to all PUC stations it has not been possible to assess detailed database. The IT cell of department of transport does not analyse the PUC data to know if all registered vehicles are complying with required tests and if all vehicles are turning up for tests. The physical inspection of centres have shown that PUC testing operator do feed the vehicle registration number plate and this automatically retrieves the owner name, address etc from the transport department's central server. Therefore, technically it is possible to know how many vehicles out of total registered vehicles are turning up for the tests but this data is not analysed or formatted to make this analysis available to use it for enforcement.

However, effort made by EPCA to analyse the available data shows that the level of compliance in Delhi is even less than a quarter -- only 23 per cent of total vehicles turn up for tests. Such an analysis has not been possible for Haryana and Uttar Pradesh as the data is purely manual and complete data for all centres with adequate detail are not available.

EPCA recommends making annual vehicle insurance policy mandatory and conditional with PUC certification.

III. Analysis of emissions data show low failure rate and lax emissions limits:

It may be noted that under the PUC programme tests are carried out to check the pollutant concentration in the exhaust of the vehicles in idle condition to see if poor maintenance or any malfunction has caused the vehicle to emit more than it is designed to emit. There are two set of PUC norms for both petrol and diesel four wheelers – for vehicles that comply with Bharat Stage (BS) IV emissions standards and for pre-BS IV vehicles. For two and three wheelers, the norms are set according to year of manufacture and nature of engine (2/4 stroke). Moreover, in petrol vehicles – cars and two-wheelers, as well as CNG vehicles, concentration of hydrocarbon and carbon monoxide are tested. In addition lambda (air to fuel ratio) is measured to ensure that the operative conditions that are needed for optimum functioning of the catalytic converters are functioning well as these are needed to clean up the petrol exhaust.

In diesel vehicles only smoke density tests are conducted. While carrying out these tests engine speed and oil temperature are also monitored to ensure that the tests are being conducted on a sufficiently warmed up engines and the optimum acceleration speed has been achieved that is needed to do the smoke density test.

Compliance level in Delhi

In Delhi, the Department of Transport, Government of NCT of Delhi provided EPCA with the PUC records for the months of November and December 2016 and January 2017. For this three month period, the total number of PUC tests conducted was 1.37 million. The total vehicular fleet in Delhi stands at 6.47 million vehicles as on August 1 2016 (As per the Department of Transport, Government of NCT of Delhi). Of these, 2 and 3 wheelers account for 4.18 million vehicles, or 64.6 per cent, and 4 wheelers (cars and taxis) account for 2.12 million vehicles, or 32.8 per cent. Even if these numbers are reduced to adjust for scrappage and retirement of vehicles the numbers are still very substantial and much higher than 1.37 million vehicles.

In Delhi, all vehicles except those adhering to BS IV emission standards are expected to get PUC certified every three months. BS IV vehicles are expected to get PUC certified annually. This means every quarter entire vehicular pre-BSIV fleet of Delhi has to come for PUC tests. To that is added at least a quarter of the BSIV vehicles that take annual certificates.

As per registration data provided by the Department of Transport, Govt. of Delhi, 35 per cent of the four wheelers registered in Delhi, or little less than 8,00,000 vehicles are meeting BS IV emission standards. The remaining 1.38 million vehicles are meeting BS III emission standards or lower. The entire 2 & 3 wheeler fleet numbering 4.18 million is adherent to BS III emission standards or lower. Thus, the number of PUC tests to be conducted per quarter should at least be¹ 5.91 million. But the PUC data accessed for Delhi, for the period of November 2016 to January 2017 (3 months) shows tests of only 1.37 million vehicles.

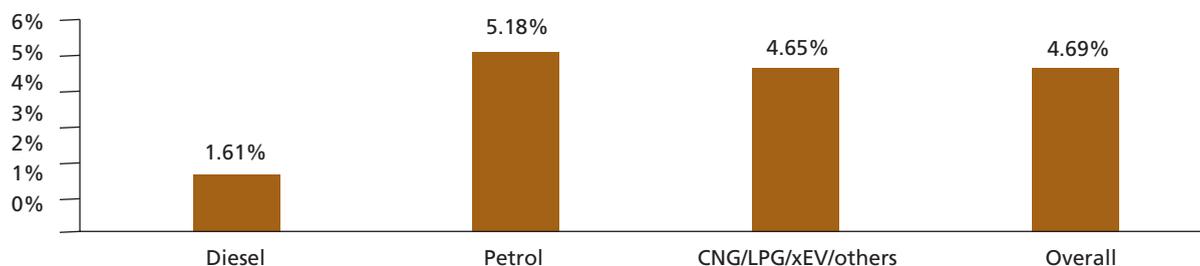
This works out to be a compliance rate of 23.2 per cent. A large number of vehicles in Delhi remain outside the PUC testing network.

¹ Calculation done on the basis of data provided by the Department of Transport, Government of NCT of Delhi and the Ministry of Road Transport and Highways. PUC rules as per Section 115(7) of the Central Motor Vehicle Rules of 1989 and further modified by the Delhi Govt. say that the validity of a PUC certificate is 1 year for a BSIV vehicle and 3 months for all other categories of vehicles.

Failure rate: The overall analysis of PUC data shows dismally poor failure rate among vehicles. Nearly all vehicles pass the tests. In Delhi the overall failure rate is 4.69 per cent. For the diesel vehicles tested, the failure rate stands at 1.68 per cent, compared to 5.18 per cent for petrol vehicles and 4.65 per cent for all other fuel categories (CNG/LPG/xEV's/Others). In UP towns, the overall failure rate is abysmally low, at 0.49 per cent – 0.39 per cent in 2 wheelers and 0.59 per cent in 4 wheelers.

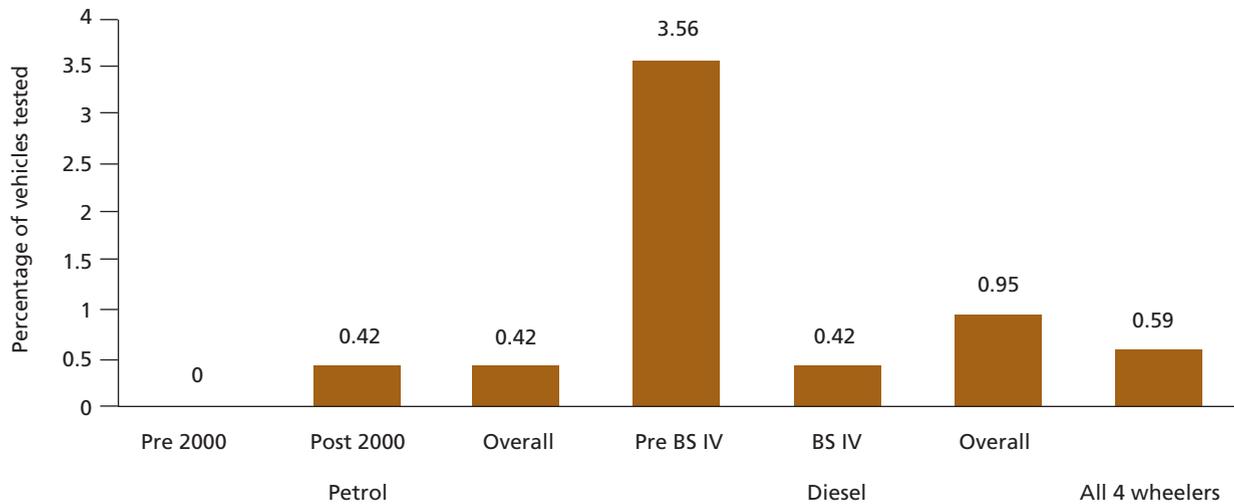
Thus, huge investments made in setting up such large number of decentralized testing centers cannot even identify 15 to 20 per cent of the most grossly polluting vehicles on the road. This is particularly a matter of concern in the case of diesel vehicles. This programme can barely make any difference to the air quality. (see Graph 2: Failure Rate by Fuel Type in Delhi and Graph 3: Failure Rate in four wheelers in Uttar Pradesh (in % of vehicles tested)).

Graph 2: Failure Rate by Fuel Type in Delhi



Source: Analysis of data provided by the Department of Transport, Govt. of NCT of Delhi in 2016-17.

Graph 3: Failure rate in four wheelers in Uttar Pradesh



Source: Department of Transport, Govt. of Uttar Pradesh, the Ministry of Road Transport and Highways and ARAI in 2016-17.

Reasons for poor failure rate can be poorly done tests, malpractice as well as weak norms. In fact, it has been observed that often PUC operators do not record the failure data or abort the test if they suspect the vehicle will fail the test. One of the reasons is that they do not collect the PUC testing fees before conducting the tests. If vehicle fail the test the vehicle owner refuses to pay for the test. Hence the operators have no incentive in recording the failed tests. This practice will have to be changed. All vehicle owners must be asked to pay for test upfront and not depending on the results of the test.

EPCA recommends making advance payment for test mandatory and software should be modified accordingly.

IV.Weak PUC norms

Review of the actual tested emission values have also indicated how weak the PUC norms are. Doing this analysis is however challenging as the data provided to EPCA by the Department of Transport, Government of Delhi is aggregated, and emission values are not separate for vehicle categories and their vintage/emission norms. Even though these details are recorded at the PUC centre, the data provided from the centralized PUC server do not include these details. However, analysis of the limited information gives deep insight into the problem.

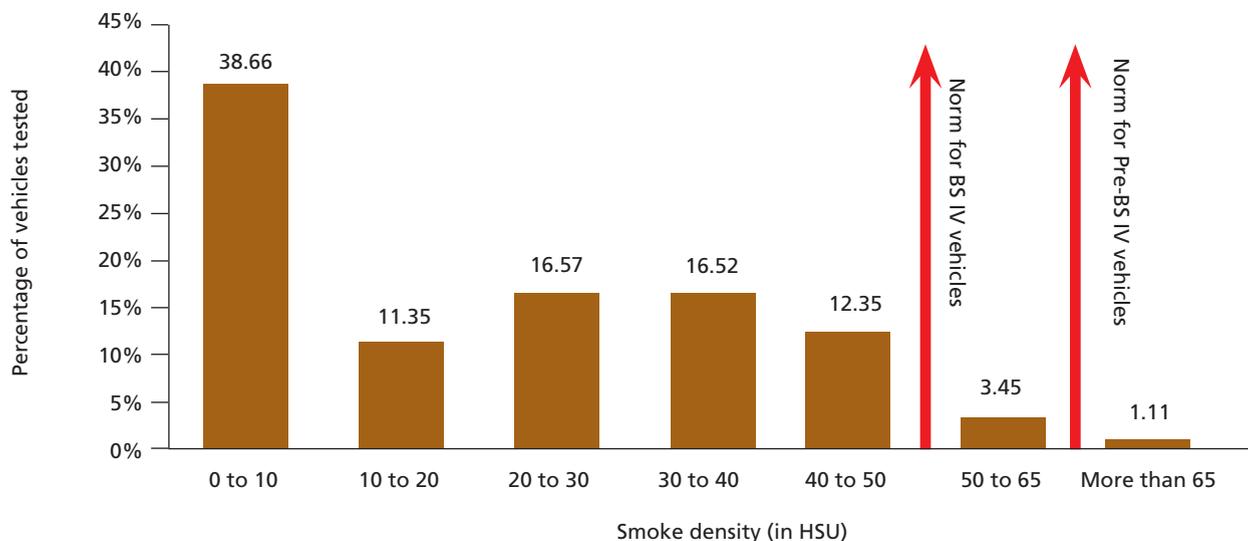
Norms for diesel vehicles

EPCA has analysed the available data to find that nearly all diesel vehicles of all vintage are below 50 HSU which is the norm for BS-IV vehicles. Rarely any vehicle exceeds the limit value of 65 HSU that is the norm for pre-BSIV vehicles. The current smoke density norms are too lax to fail any vehicle as the modern engines cannot have such high level of smoke unless very badly out of tune.

In diesel vehicles the one and only test is smoke density test. In diesel vehicles, the one and only test is smoke density test. In 2004 MoRTH had modified the smoke density test procedures in 2004 to introduce two additional test parameters for diesel smoke density test which is measurement of engine speed in RPM (Revolutions Per Minute) to ensure required acceleration at the time of testing and also oil temperature tests to ensure warmed up engines for tests. Subsequently, in June 16, 2015 the rules were amended by MoRTH to simplify the test. Oil temperature test was removed. If a vehicle was able to pass the smoke density test in a cold state when emissions are high it implies that the smoke density emissions will be lower if the engine is in a sufficiently warmed up state. This now requires that a vehicle which does not meet the norm in cold state can be retested with the engine oil temperature having attained 60 degree centigrade, signifying a warmed up engine.

HSU limit will have to be tightened for all diesel vehicles. Overall, more than three-fifths of the vehicles have smoke density values less than 60 per cent of the norms meant for BS-IV vehicles. The norms are so lax that a large number of vehicles can easily meet the standards with a margin of 80 per cent or more. (See Graph 4: Distribution of tested smoke density values for diesel vehicles).

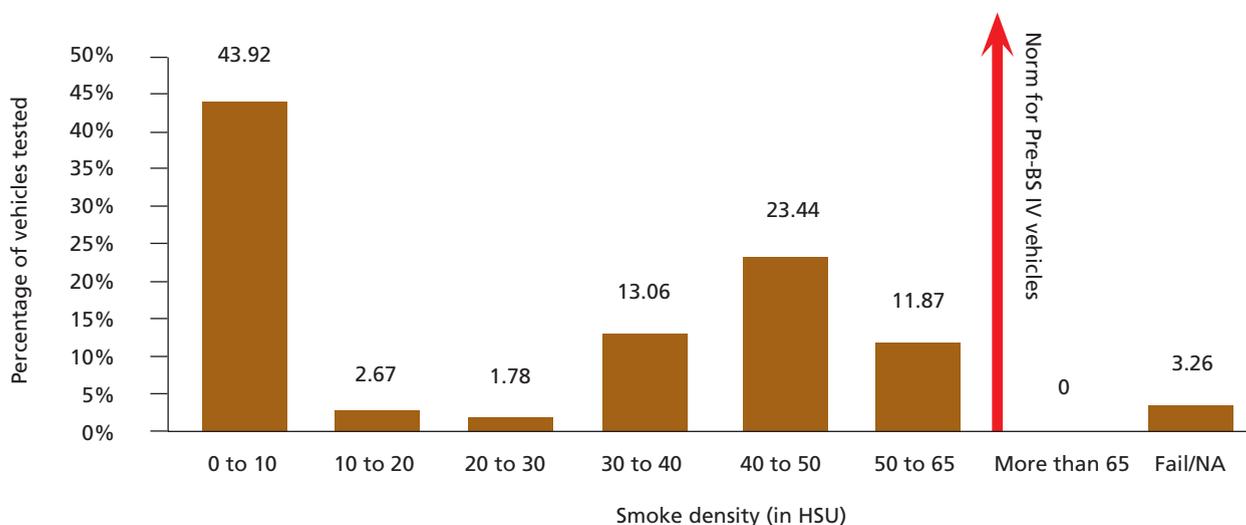
Graph 4: Distribution of tested smoke density values for diesel vehicles in Delhi (in HSU units)



Source: Department of Transport, Govt. of NCT of Delhi, the Ministry of Road Transport and Highways and ARAI in 2016-17.

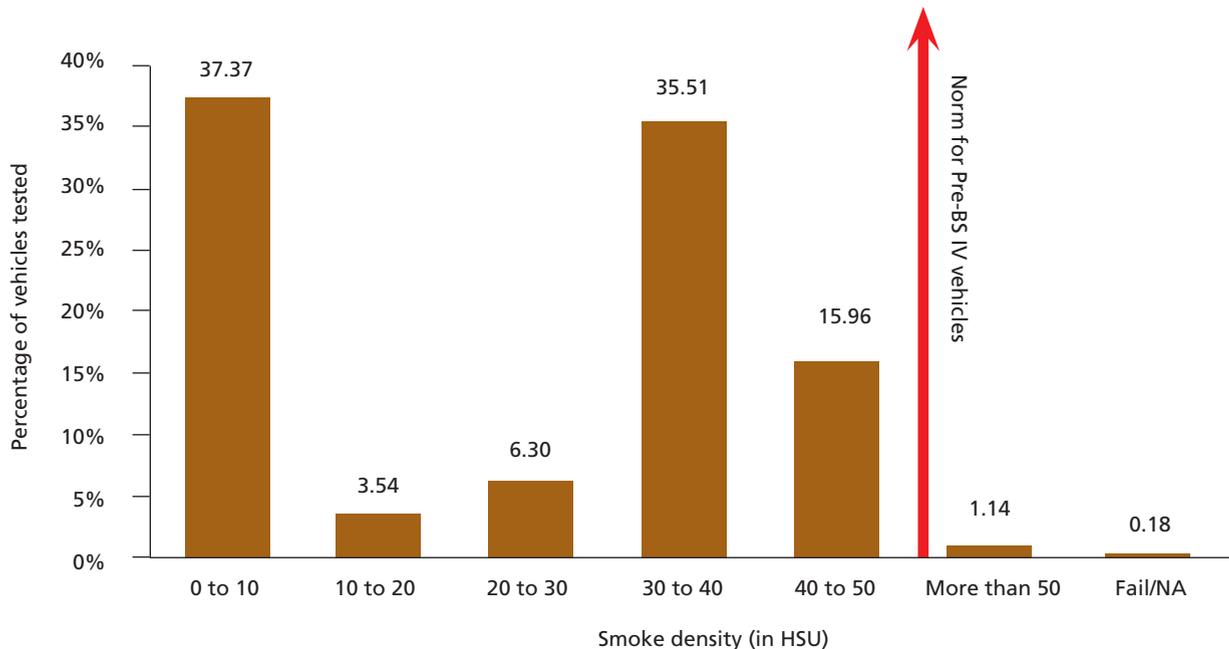
In NCR towns of Uttar Pradesh, about 48 percent of the BSIV diesel 4 wheelers have smoke density values less than 60 per cent of the norms meant for BS-IV vehicles. For Pre-BS IV vehicles, 60 percent of the 4 wheelers have smoke density values less than 60 per cent of the already lax norms (See Graph 5: Distribution of tested smoke density values for Pre-BS IV diesel vehicles in NCR towns of Uttar Pradesh and Graph 6: Distribution of tested smoke density values for BS IV diesel vehicles in NCR towns of Uttar Pradesh).

Graph 5: Distribution of tested smoke density values for Pre-BS IV diesel vehicles in NCR towns of Uttar Pradesh (in HSU units)



Source: Department of Transport, Govt. of Uttar Pradesh, the Ministry of Road Transport and Highways and ARAI in 2016-17.

Graph 6: Distribution of tested smoke density values for BS IV diesel vehicles in NCR towns of Uttar Pradesh (in HSU units)



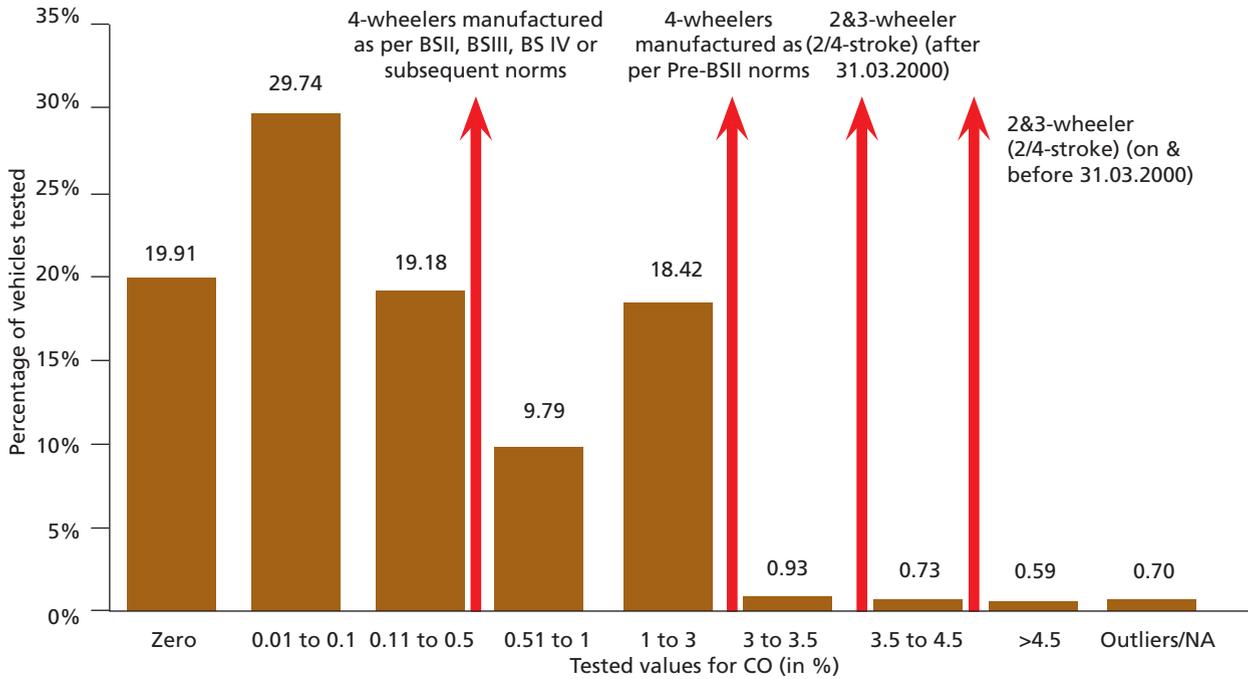
Source: Department of Transport, Govt. of Uttar Pradesh, the Ministry of Road Transport and Highways and ARAI in 2016-17.

Norms for Petrol vehicles

Data from 12 lakh petrol vehicles in Delhi shared with EPCA has come clubbed together for cars and two-wheelers. It has not been possible to disaggregate them. Nonetheless, frequency distribution of all petrol vehicles have still been checked vis a vis the norms meant for both cars and two-wheeler just to understand where most of the values fall.

A large number of pre-BSIV vehicles are easily meeting the carbon monoxide standards meant for BSIV vehicles with a margin of 80 per cent or more (see Graph 6: Distribution of tested CO emissions for petrol vehicles). But it is also very erroneous to see that close to 20 per cent of 12 lakh vehicles have zero carbon monoxide values. Zero values of CO and HC can be overlooked in some new vehicles. But sensitivity of instrument (lowest value that it can record) should be verified in case any PUC centre reports many zero values.

Graph 7: Distribution of tested Carbon Monoxide emissions for petrol vehicles – 2, 3 and 4 wheelers in Delhi (In parts per million)



Note: This is combined data for cars and two-wheelers

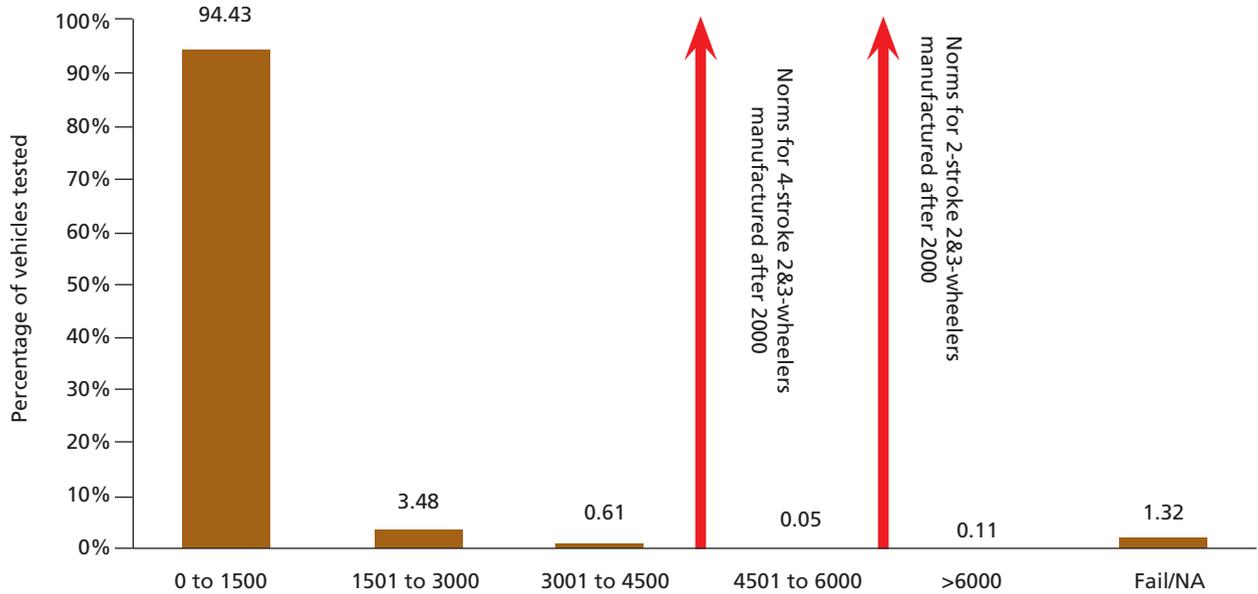
Source: Computed based on data shared by Transport Department of Delhi

Similarly, in case of hydrocarbon emissions when all vehicles are included almost 88 per cent of two and four wheelers meet the most stringent standard.

Disaggregated data for petrol two-wheelers are available from the NCR towns of UP.

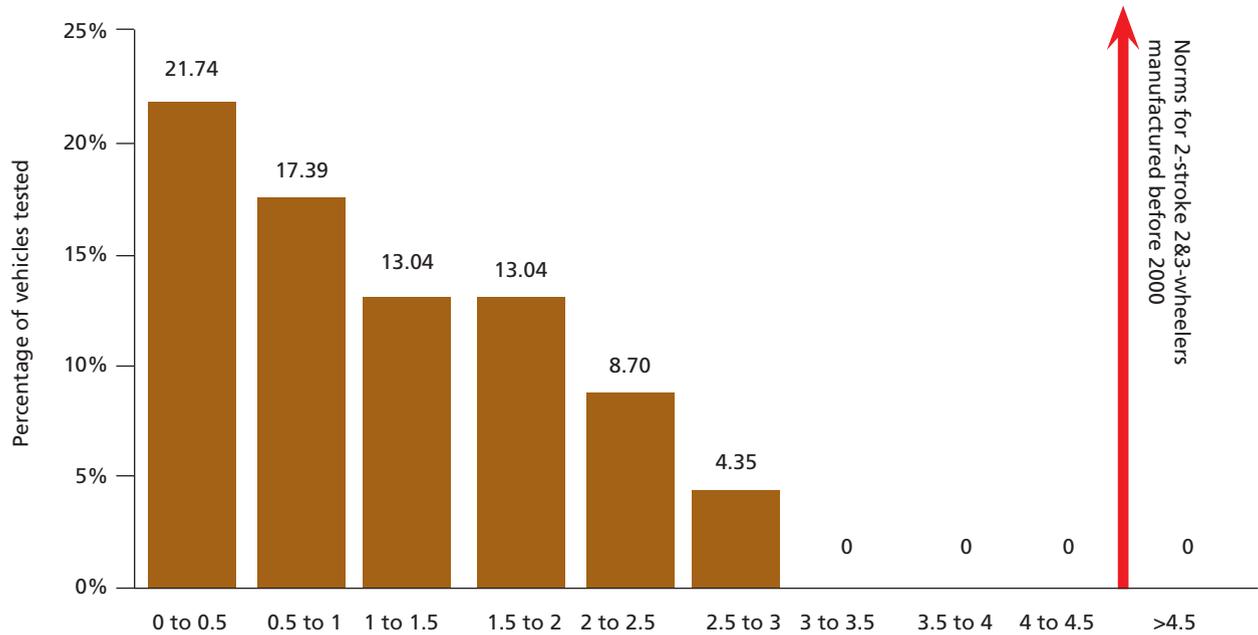
Similar trend has been noted in the two-wheeler segment. Data of about 7000 two-wheelers from UP towns have been analysed. (See Graph 8: Distribution of tested hydrocarbon emissions for 2-wheelers manufactured after 2000 – NCR towns of Uttar Pradesh and Graph 8: Distribution of tested carbon monoxide emissions for 2-wheelers manufactured before 2000 in NCR towns of Uttar Pradesh). This shows that the actual emissions concentration in nearly all these vehicles is significantly lower than the standards.

Graph 8: Distribution of tested hydrocarbon emissions for 2-wheelers manufactured after 2000 – NCR towns of Uttar Pradesh

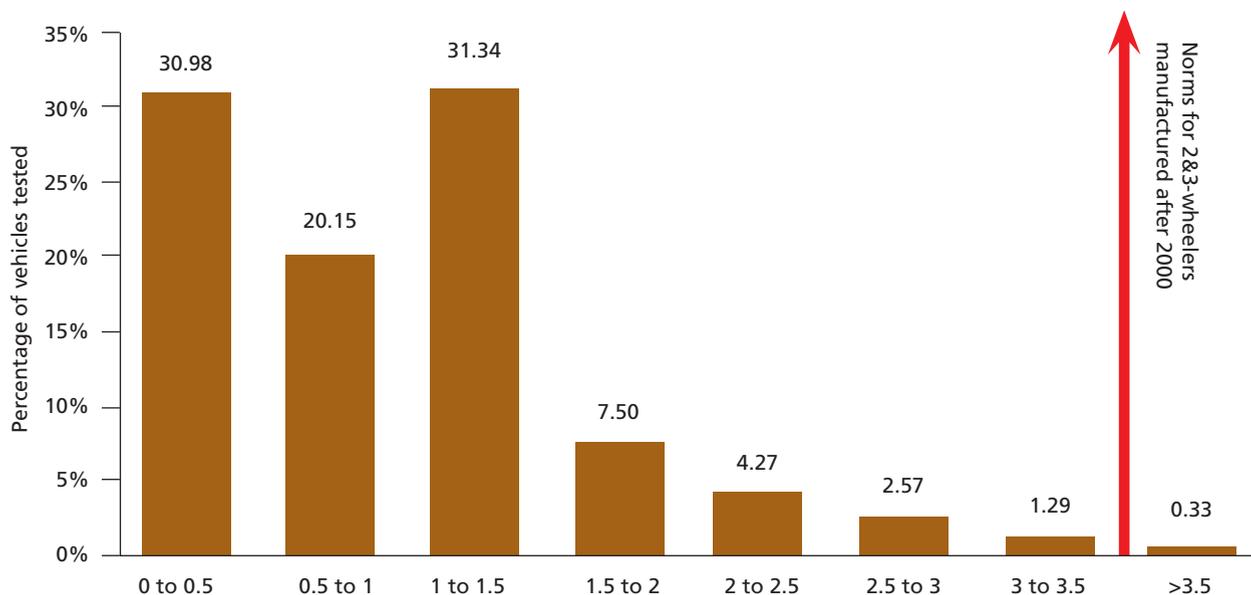


Source: Department of Transport, Govt. of Uttar Pradesh and ARAI in 2016-17.

Graph 9: Distribution of tested carbon monoxide emissions for 2-wheelers manufactured before 2000 in NCR towns of Uttar Pradesh



Source: Department of Transport, Govt. of Uttar Pradesh and ARAI in 2016-17.

Graph 10: Distribution of tested CO emissions for 2-wheelers manufactured after 2000

Source: Department of Transport, Govt. of Uttar Pradesh and ARAI in 2016-17.

2.5. PUC norms and testing procedures for diesel vehicles need to be upgraded: While PUC tests for petrol vehicles are more evolved and have higher degree of complexity, the one and only smoke density test for diesel vehicle based on simple test procedures and lax norms is very inadequate and ineffective. It may be noted that smoke test was introduced for older generation vehicles to reduce the visibility problems of diesel smoke. But given the fact that particulate emissions are a serious concern from diesel vehicles, there is no real correlation between smoke density and particle emissions which is the main concern for diesel vehicles.

The scientific literature review carried out by EPCA shows that smoke is not a good surrogate for tiny particles. There can be a risk of misclassifying polluters – low smoke emissions can also be high emitter of particulate matter. Even in Europe virtually no vehicle fails the smoke test. Other governments including China, Hong Kong, Singapore, the US, etc are now conducting these tests on chassis dynamometer to simulate speed. This makes the emissions test more rigorous. In fact other countries have tight smoke density limit – Singapore is 40 HSU; in Indonesia, Thailand, Hong Kong, Malaysia it is 50-HSU for all genre of vehicles. China is further developing a nationwide I/M system for evaluating nitrogen oxide emissions from in-use heavy duty diesel vehicles.

Singapore conducts Chassis dynamometer Smoke Test. Australia also carries out dynamometer based DT80 and DT60 tests designed for typical 'real world' vehicle emissions and requires the use of a dynamometer with inertia simulation. 'Lug-down' loaded test is conducted in United States and Hong Kong. In this test chassis dynamometer is at a fixed speed – vehicle running at full throttle; dynamometer load is gradually increased to reduce the engine speed until the engine is labouring or 'lugging'. Europe is looking at load test to measure NOX.

Smoke tests are irrelevant in advanced diesel engines. It is therefore important to design these upgraded test procedures for diesel vehicles – especially commercial vehicles – on a priority basis to make the tests more relevant and effective. In future the real driving emissions testing with portable emissions monitoring requirement for Euro VI vehicles will address the problem for that genre of vehicles. But the current fleet and ever increasing BSIV diesel fleet will require upgraded test procedures.

It may also be noted that currently NOx emissions tests are also not possible under PUC regime. This will require more advanced equipment that is possible only in centralized automated test centres.

Petrol vehicles: Under PUC the tests for petrol vehicles are more evolved and these are tested for carbon monoxide and hydrocarbons along with lambda (that indicates the optimum condition needed for proper functioning of catalytic converters). But these tests will have to be conducted with credibility. This is serious issue at a time when Delhi that already has more than 900 PUC centres is trying set up more. This investment can go waste without an effective system in place. It has been noted that lambda tests are carried out only in Delhi and not in the NCR. It is important to mandate lambda tests across NCR. Lambda is oil to fuel ratio that indicates the optimum internal environment that needed for proper functioning of the catalytic converters that cleanse the exhaust.

In China, petrol vehicles follow IM 240 dynamometer test for light-duty vehicles. A vehicle is mounted on a dynamometer – allowing simulation of the vehicle inertia - driven over a transient cycle. Duration of the test is 240 seconds. Evaluation study of these tests have concluded that they can identify more than 80 per cent of excess HC and CO emitters, with few errors of commission

EPCA recommends that the Ministry of Road Transport and Highways should review the lax norms and test procedures especially for diesel vehicles and take necessary action to tighten the norm and upgrade test procedures for effective results. The tests for the petrol and CNG vehicles should be carried out with strong accountability.

V.State of emissions testing equipment in PUC centres

EPCA investigation has taken note of the 2003 guidelines of the Ministry of Road transport and Highways, that states that every PUC equipment manufacturer/supplier must comply with the Code of Practice and submit an affidavit for the same along with the instrument model submitted for type approval to the respective Test Agency. EPCA kept these guidelines in view while assessing the PUC centres. These guidelines include:

- PUC equipment manufacturer/supplier shall supply copy of type approval certificate with date of validity along with the PUC equipment.
- The validity of the type approval certificate of the PUC equipment shall be 5 years after the expiry of which the PUC equipment manufacturer/supplier shall get it revalidated from the test agency.
- PUC equipment manufacturer/supplier shall enter into AMC for a period of 5 year with the authorized PUC test agency based on agreed charges. The AMC shall be comprehensive (including spare parts) but does not include maintenance of PC/PC peripherals of the computerized PUC equipments.

This needed to ensure timely maintenance of the equipments for testing for authentic results. The calibration and method however varies across products of different equipment manufacturer. The market is inundated with machines of different kind, with only the most basic methods being standardized. The only check in this system being that all such machines acquired by the PUC Licensee have to be type approved by the ARAI (Automotive Research Association of India).

Calibration procedure for testing of Gas Analysers, to be followed by the PUC Agency:

- Check the span and zero calibration using sample gas of suitable value for CO as well as HC.
- Check the electrical calibration
- Check that the sampling

Diesel Testing protocol to be followed by the PUC Agency:

- The meter shall have the standard accessories as specified by the manufacturers. It shall be checked that the internal pipes etc are not deteriorated or damaged to ensure that there is no leakage.
- The functionality of oil temperature and RPM sensor.
- The heating system for the optical chamber is functioning.
- The purge air system is working correct.
- The instrument casing is proper and has proper electrical earthing.

- Free acceleration test is carried out using a vehicle and the details print out are checked.

Delhi: As Delhi has remained under scrutiny for a long time in most of the centres inspected the emission testing machines were functioning as per procedure. However, in some stations, it has been found that leak test caps are not available and probe needs cleaning. Some operators complained that equipment service providers need to be prompt to provide the services. Most centres inspected in Delhi were found to have valid calibration certificates, barring few.

All centres were found to be operating with proper instrumentation and accessories. Probe cleaning should be improved. Filters are found to be as per procedure. RPM sensors are found to be proper. Oil temperature measurement is not required as per the changed procedure for diesel vehicle test.

Ghaziabad: Most of the centres inspected -- 7 out of 10, did not have a proper probe and filter was missing. In M/s Sharma Filling Station (centre code-724); there was no probe and only rubber tube was available. Diesel probe was broken and leaking, yet the operation continued normally in Vardhman Petroleum (centre code- 902). Three centres had proper copper probe with a normal length of 30 cm. No extension pipes were available in any of the centres.

Gautam Buddh Nagar: Out of the five centres audited, two centres did not have copper probe whereas others have proper probe of sufficient length. The filters were cleaned in all the centres frequently.

Bulandshahr: In one of the PUCC named Shri Khatu Shyam Pandit Auto Service (centre code- 1075), the diesel probes was absent though machine was there. This was the same case in one of the other centre i.e., M/s Nida Welfare Society (centre code- P-614/D-849). Copper probe was missing in six PUCCs

Gurugram: Here the team found largely the use of Ozone machine and Indel machine for emissions testing. Six PUC centres do not have diesel testing machines, the rest have functioning petrol/diesel machines but it used the petrol probe to check the diesel vehicle that the EPCA team had taken.

The rod used in the probe for the petrol machine was not copper. The length was insufficient (less than 30 cms) in 7 centres. Lens in the smoke opacity meter were absent in 5 of the PUC centres. Two centres did not have probes for the smoke opacity or the gas analyzer test. Not a single centre had RPM sensor or jump cables to take RPM readings. None of the inspected centres had air conditioning for the testing machines. A.K PUC Center had rusted diesel testing machines. The smoke opacity machine had not been calibrated. The operator used a diesel probe to check the opacity, but pointed to the petrol testing machine when asked how he gave the inspection team, a pass certificate with a broken machine.

Faridabad: Most centres use AVL and Ozone hardware and software. All 5 centres inspected had upgraded petrol and diesel machines. This is primarily due to the active initiatives of the Faridabad RTO implemented last year, wherein all centres found without upgraded PUC machines were suspended or shut down. All 5 centers had separate probes for the petrol and diesel machines. Only one centres (Indrasuddha Associates) had a faulty diesel testing machine. The operator despite that checked our vehicle with a petrol probe and issued us a pass certificate.

Rohtak: Most centres use AVL, Ozone or Sigma machines. AVL machines were found to be periodically calibrated. Out of the 10 centres inspected, 5 centres did not have functioning machines. Out of the remaining 5 only three PUCCs had proper calibrated machines with certificates (Sanjay PUCC, Rathi PUCC and S.K. PUCC). Only 4 stations had Copper rod probe. S.K PUCC, which had a proper calibrated machine, did not have a diesel probe.

The length of the probe was insufficient in 6 PUCCs. Broken pipes, with haphazard repairs were a common sight. None of the centres in Rohtak had air conditioning for the machines. None of the of the centers had a cleaning mechanism for lens of the smoke opacity test machine.

Overall, it was found that the PUC centres have annual maintenance contract with the equipment manufacturers. It is evident that the OEMs reach out to the PUC agencies to calibrate and keep machines updated. This has proved to be effective in keeping the machines in satisfactory conditions. The AMC at the moment only covers machines and computer peripherals (testing software). The AMC should extend to probes and pipes. Broken pipes and damaged/overused/ non-copper probes/ insufficient length were a common observation through the three regions of Rohtak, Gurgaon and Haryana. This is crucial to the testing process as a broken pipe could mean erroneous readings and a faulty test result.

Bulandshahr: In all the PUC centres tested in Bulandshahr, fake software was found. This software allowed manipulation by the operator, allowing them to generate randomized RPM's, CO, HC and HSU readings. These software alterations were fairly advanced, fixing the parameters for pass/fail of vehicles automatically, and there was a prepared menu of cars and makes with different pre-set values for RPM and HSU, independent of year of manufacturing. In an extreme case, there was no software at all present at a centre, but simply an Adobe Photoshop programme to manipulate and print the PUC.

The software "Polcer" was a very common fake PUC programme used.

There were 3 centres found operating without any emission analyzing machines at all. These were using altered software and were functioning openly, issuing false certificates without any attempt to hide the fact that there was no machine.

Bharatpur: In all the PUC centres checked, no logs were maintained; certificates were issued through fake software. None of the inspected PUCs complied with the testing process, no RPM sensor was deployed to take RPM readings, and no probe was inserted for the smoke opacity testing of the audit team's diesel vehicle.

None of the inspected PUCs were operated by the trained designated operator.

Pragati PUC (code P-49/ D-50) the testing software had an option to "generate readings", with a drop down option for car models. The same was found in SSS Mobile PUC centre (RJ 05). Alora Service Station (D-51) had no probe, no Standards or Rates display boards. The Alora PUC, whose license was recently renewed, were not following the standardized rates as per the RTO.

Upon inspection, SSS Mobile PUC, Alora PUC and Pragati PUCs generated different readings for the inspection vehicle.

Bharatpur RTO issues PUC license to service/filling Station, mobile station, and automobile workshop. This has led to a situation where such mobile stations have moved from their original location to more lucrative locations across the town. This has led to a situation where the PUC inspectors are unaware of the precise location of that PUC, thwarting any measures to inspect mobile PUCs in Bharatpur.

Alwar: In Alwar, as in Bharatpur, the operators and owners of the PUC centres reported that most PUC centres were not operational. The entire district had 28 registered PUC centres, or about 14 physical PUC centres (accounting for Petrol and Diesel vehicles). The audit team was unable to find any PUC stations on the state and National highways in the district. The RTO clarified that all of the PUC centres were situated within the city of Alwar. Even within Alwar, the team visited more than fuel stations/ listed PUC centres, only to find that PUC centres were either shut or not in operation. The stated reason for this was that throughout the Rajasthan districts of NCR, there was very little enforcement of the PUC law by the traffic police. As a result, most PUC centres generated very little revenue and were forced to eventually shut down.

All the 5 centres inspected had no certification available in site at the time of inspection. Emission analysis machines were present but were outdated without valid calibration certificates. Fake software was noticed in all the centres, and the approved testing procedure was not followed. There was no operational knowledge with the operators, and no RPM sensor was deployed to take RPM readings or

no probe was inserted for the smoke opacity testing of the audit team's diesel vehicle. Two centres were mobile PUC vans, which had old, outdated machines with tampered software.

Near the Rajasthan-Haryana Border, near Bawal in Rewari District, the audit team encountered an extreme form of unauthorized PUC certification. Just beyond the state boundary, some 500 odd meters into the state of Haryana, the team encountered several empty hand-carts (wheeled thelas of the type of which street vendors sell fruits, etc.) in a row by the side of the highway. There were at least 4-5 of these, positioned 100-150 metres apart on the road leading towards Delhi. These had large plastic printed boards pasted on their traffic-visible side, which said “*Pradushan Jaach* Certificate available here, Rs 100/- only” in Hindi. These boards were further lit by tube lights attached to the frame of the hand-carts, for better visibility at night.

These handcarts were empty apart from the lit board, i.e, no gas analysing machines or even a computer/printer present for printing a PUC certificate. They were each manned by a single man. When the audit team approached one of these centres, the person removed a small 12 inch laptop from a bag below the handcart. He then proceeded to physically enter the car's registration number into the software, instead of taking a picture of the license plate, which is required as per the approved procedure. The software on his laptop allowed him to enter the car's registration number manually into a photo-shopped image of the license plate, which appeared like a picture.

Following this, the operator then proceeded to go cross the service road beside the highway, at a distance of at least 30 feet from the hand-cart. There was a wire running from the cart to this dark, unlit area next to the service road. Here, the operator crouched and moved a dark piece of cloth. Below this cloth, in a carefully dug ditch were a printer, and a set of car batteries, which powered the entire mechanism including the tube lights. The operator connected the printer to the laptop via a USB cable, and proceeded to print an authentic PUC certificate for the audit team's vehicle, complete with PUC centre code included (annexure attached).

The fee charged for preparing such a certificate was Rs. 100, more the prescribed amount of Rs. 80. The audit team suspects that the reason for such secrecy, in terms of hiding the equipment in a ditch and so on was so that they entire set up could be abandoned at the least hint of trouble. However, it remains to be seen how these fly-by night PUC operators are able to procure the blank PUC certificates, which are supposed to be tightly regulated and issued only to authorized PUC operators.

It was curious how these PUC certification centres emerged as soon as the territory of Haryana began. One explanation is that since enforcement of the PUC certification is lax in Rajasthan, these have emerged organically as a response to the tighter PUC compliance in Haryana, and in cities closer to Delhi.

Cities of Haryana, Uttar Pradesh and Rajasthan: The software in most of the PUC centers was tampered with. Pre-set readings which were randomized for each test by the software itself was an issue common to all the districts of Haryana and Uttar Pradesh audited. The software is said to be issued by the OEM, but we found different versions of the same software at different centers. Certain softwares allow for the data of old tests to be stored and reused for new tests. Such a malpractice raises question on the integrity of the software.

A common observation in the region of Haryana, especially those inspected by the EPCA Audit team, was the proliferation of fake certification software. All regions inspected had an issue of fake or unauthorized software being used to issue a PUC pass certificate.

The issue stems from the fact that the software is often not standardized or connected to a central server, as is in Delhi or any other mechanism to counter check it against.

Standardization of Testing Software: Software is supplied to the PUC agency by the OEMs of the machines that they have acquired. However there are no regulations or method for the functioning of this software to sync them for cross-checking or authentication of data, as is case of Delhi. The team

came across different kinds of generic certificate software (certificate management system, Ozone testing programme, Ozone certificate programme, testing software and certificate management programme are few of the software we encountered)

VI. Calibration of instrument and Calibration report

Regular calibration of instrument and equipment is critical to get authentic test results. The EPCA teams checked for evidences of calibration.

Delhi: Most centres inspected in Delhi were found to have valid calibration certificates. But some did not. For example, in Arora Service Station (code P-495, D-115) calibration information was not available. In a few centres, the displaying of the certificates needs to be improved. The test operators informed that instrument providers do the on-site calibration.

Ghaziabad: Out of the 10 centres audited, eight of them did not have calibration certificate. Only two centres namely, Mohan Shiva (centre code- 445) and Harit Prayavaran Samiti (centre code- 582) had their calibration certificate with them.

Gautam Buddh Nagar: Out of the five centres inspected, four of them have their calibration certificates, which mentioned the next due, date whereas only one centre Nature Paryavaran Samiti (centre code- 832) did not have the calibration certificate.

Bulandshahr: None of the centres has the calibration certificate with them. Only one centre had a certificate but it shows that the last calibration was done in 2013.

Gurugram: Only two out of the 10 tested PUCCs had a calibrated machines to test diesel vehicles. PUCCs do not have the calibration displayed or present at the checking center. When enquired, most operator state that the owner (Licensee) keeps the certificate. Even in instances where the calibration was done the machines were not connected to the computer.

Faridabad: None of the PUC center inspected had displayed their calibration certificate. The calibrations of the machines are done every 4-5 months according to the operator.

Rohtak: All 10 PUCCs inspected, have their machines regularly calibrated by the OEMS. This seems more due to the practices of the OEMs to cash in on the AMC scheme to make money of these instruments.

Type approval or calibration certificates are not displayed, thus difficult to ascertain if the calibrations are indeed made.

By the accounts of the operator the OEMS take the machine to their centers and calibrate it. Thus the operator has no knowledge of the process or the necessity of the process.

Bharatpur: None of the PUCCs inspected had calibrated their machines, neither had they displayed the calibration reports. The operators were ignorant of the requirement of calibration. In few centers the machines were recently acquired thus didn't warrant a calibration.

Alwar: All but two of the PUCCs inspected had no calibration reports, nor were the operators aware of any requirement to do so. In one centre, the calibration certificate was outdated.

EPCA recommends the following with regard to equipment and calibration:

- Software used in different make of testing equipment across NCR is not standardized and this can be easily manipulated to generate fake values. But software in Delhi is uniform and standardised as it is linked with a central server. Same step be taken in the rest of NCR so that single standardized software is used.
- Enforce calibration of testing equipment with utmost stringency and link with permit conditions that can be revoked if such violations are noted.

VII. Reliability and authenticity of testing and malpractices

Delhi: For petrol vehicle testing in most centres inspected the probes used for testing are leak proof with the sufficient length. In one center, low flow error code was observed in the instrument pump work. All the centers inspected had instruments for RPM measurement.

For diesel vehicle testing all the centers inspected had provided RPM sensor. Oil temperature sensor was not available as they are required anymore. GO/ NO GO Gauge was not provided as they are required anymore.

Some anomalies have been observed in Delhi. The team had taken a car for decoy testing to first Anand service station (code P 276) Mahipalpur on Delhi Gurgaon road where the vehicle failed as this BSIV vehicle recorded 60 HSU much higher than the norm of 50 HSU. But the same vehicle when taken immediately to Rajasthan Rajpath Filling Station (Khasra No 4, Delhi-Jaipur Road, NH8 Samajha) it recorded 47 HSU and it passed. There are therefore questions about the repeatability of the tests, the way the test has been conducted.

Similarly, in Arora Service Station (Code 495 D- 115) where the team had taken a diesel car for testing, the operator checked oil temperature, and RPM but did not check the exhaust for smoke opacity. Initially he said that it has passed and was about the certificate. But on suspecting changed his mind and claimed that the car did not have the requisite RPM. He was also overcharging for the certificate.

Ghaziabad: In a centre named Sharma Filling Station (centre code- 724), RPM and respective emission values for a decoy car was selected through a drop down menu, and then the certificate was issued without any testing of the car (neither checking the RPM or connecting the Exhaust to the gas analyser at all)

In the Anil Paryavaran Samiti centre (centre code- 347), a certificate was issued to a diesel car without giving any acceleration (no proper flushing) and the RPM readings in flushing tests were all similar.

There is a proliferation of fake software and machines that allow operators to manipulate and pre-feed the values in the system. This is especially seen in diesel vehicles, where the test is much lengthier.

Many operators have no knowledge of the process. They do not have basic procedural knowledge on how the machine functions, what tests/calibration are necessary or even the fact they are not following the procedure. There is a proliferation of fake software and machines that allow operators to manipulate and pre-feed the values in the system. This is especially seen in Diesel vehicles, where the test is much lengthier. In many cases, the person issued a license to operate is not the actual operator. In multiple cases, the EPCA inspection team even saw a blank pre-signed training certificate, which means that anyone can write their name on it, creating a falsified training certificate.

Gautam Buddh Nagar: In a centre with code 832 software for diesel vehicle was fake. He did not care to insert the probe properly into the exhaust pipe. PUCC present without the serial number and the PUC centre code. The centre name was unknown and even the operator was unaware of the name of the centre.

Out of the five centres audited, fake software for diesel vehicle was found only in one of the centre. In addition, the operator did not care to insert the probe properly

Bulandshahr: In a centre Kamlesh Welfare society (center code- 1190), had a fake software that asks in a pop-up box, "Press 'Yes' to Pass and 'No' to Fail.

A centre Narendra Paryavaran Sewa Samiti (centre code- 687) issued a fake PUCC for the decoy diesel vehicle without any machine present in the centre. It had a fake software which allows operator to choose from list of vehicles having different pre-set values for RPM and HSU which is independent of year of manufacturing of the vehicle.

The Adobe Pagemaker and photoshop was being used to manipulate and print PUC's in a centre named Durga Sewa Sansthan (centre code- 899).

In a centre M/s. Nida Welfare Society (centre code- P-614/D-849) is issuing a PUC but did not have a probe. The operator issued a fake diesel certificate as the tube didn't was not attached to the machine.

A centre of Shri Khatu Shyam (centre code- 1075) also issued a PUC when the machine was unattached to the computer.

Gurugram: Not a single PUC center checked for engine oil temperature, RPM (at idle or High). Following through basic maintenance steps like conducting purge test, cleaning lens of the smoke opacity meter was not carried through.

Machines, even when they are calibrated were lying unused, as they were not hooked of the computer. A diesel test which requires approx 10 mins was completed in 2-5 minutes.

The operators don't have thorough knowledge of the testing process or even the certification method to follow. The operator of the P.K.PUC issued a pass certificate for the diesel vehicle on a petrol format certificate. Software of the A.K PUC showed a pass result as the operator was entering the details of the audit vehicle.

No RPM, No flush cycles, no check of engine oil temperature. In stations like D.K.PUC, Vishesh PUC and N. Malik PUC, the center issued us a pass certificate without even inserting the probe to conduct the smoke opacity test.

Gurgaon also had mobile PUCs. The Kuldeep PUC, that the team inspected had a license to check CNG, petrol and diesel, but had machine to check only petrol vehicle.

Faridabad: Two stations out of the five PUCs inspected were not in compliance with the testing process. However the issue of tampered/ fake software persists.

The operators do not have a thorough knowledge of the testing procedure. When enquired about the air conditioning, most operators were ignorant that the machines have to be kept at a certain temperature to maintain the efficiency of testing.

Rohtak: All 10 inspected PUCs did not measure RPM, or oil temperature to check if the engine is warmed up or not. In 5 stations the machine was not connected to the computer.

Not a single PUC center used the diesel probe for the smoke opacity test. Not a single center used jump cables to measure RPM of the vehicle. No procedure was followed at any center.

With the exception of one station, every PUC Center the team inspected issued the EPCA audit team a pass diesel certificate without checking the RPM or the conducting a thorough smoke test. The test procedure is also not standardized. The Flush cycle readings were different with a variation from 4 reading to 8 readings being taken to measure mean for the diesel vehicles.

V.K.PUC issued the audit team a pass diesel certificate without even having a smoke opacity meter. The center had license for both petrol and diesel testing, but had machines for neither.

Bulandshahr: In all the PUC centres audited, fake software was found. This software allowed manipulation by the operator, allowing them to generate randomized RPM's, CO, HC and HSU readings. These software alterations were fairly advanced, fixing the parameters for pass/fail of vehicles automatically, and there was a prepared menu of cars and makes with different pre-set values for RPM and HSU, independent of year of manufacturing. In an extreme case, there was no software at all present at a centre, but simply an Adobe Photoshop programme to manipulate and print the PUC.

The software “Polcer” was a very common fake PUC programme used. There were 3 centres found operating without any emission analyzing machines at all. These were using altered software and were functioning openly, without any attempt to hide the fact that there was no machine. In all of the centres, there were shortcomings in terms of the certification, permits and validation of instruments. In most cases, calibration was done 2-3 years ago, or not done at all.

As observed, in Gurgaon, most vehicles coming for the PUC inspection were taxis, under the compulsion of getting a PUC certificate which has validity in Delhi also. It was disclosed to the team that the taxi drivers opt to come to NCR to get a PUC pass certificate, which is mandatory to enter and ply in Delhi. They get the test done in Haryana rather than in Delhi as the system is known to be more lax in NCR than in Delhi.

Bharatpur: It was observed that most mobile PUCC licensee shifted their stations without informing or seeking permission of the local RTO. Several PUCCs stationed in automobile workshops were shut for operations. The RTO disclosed to the audit team that 70 per cent of the PUCCs in workshops were no longer functioning. These PUCCs, however still get their license renewed from time to time.

Alwar: It must be noted that the number of vehicles coming to a single centre for PUC testing was very low. It was reported that on an average, a single PUC centre tests about 25-30 vehicles in total in a month. This is in spite of there being only 14 physical locations for PUC testing for the entire district of Alwar. This shows the programme is virtually not being enforced.

It was noted that the mobile PUC centres had fake software, which enabled them to generate pre-prepared randomized values for emission testing of vehicles. However, all the centres had old machines, which they seem to have purchased on a pre-owned basis. There was no validation of these machines, and PUC certification was being issued without actual testing.

VIII. Availability of qualified and skilled PUC operators

Delhi: All centres were found to have operators who are qualified (ITI Mechanical) and trained by the instrument manufacturer and transport department as per the requirement. In one centre an operator was not found as per the requirement and had little knowledge. But as a whole the operators must be trained and with on-site audit must be trained for conducting correct test procedures.

Ghaziabad: The operator in four centres did not have procedural knowledge about the testing procedures whereas in 60 per cent of the centre had well versed operators who are aware of the testing procedures.

Gautam Buddh Nagar: Except in one centre out of the five audited, operators for the rest were well versed with the testing procedures.

Bulandshahr: Out of the 10 PUCCs audited, eight of them did not have the operators who had proper procedural knowledge for conducting the tests.

In one of the centre M/s Shri Ganesh Paryavaran Samiti (centre code- 1004), operator just had the knowledge of test procedures for petrol vehicles and did not know about the procedures for testing diesel vehicles.

In the centre Durga Paryavaran Samiti (centre code- 629), the operator had the knowledge about the testing procedures but did not do the leak test from end of the pipe instead he did just by closing the nozzle of the machine

In Haryana most PUCCs the operator trained by the OEM is not the one conducting the actual test. Even in the centers which were tended by the designated operator, the operator had no understanding or knowledge of the testing process.

Moreover, there is an issue with the training methodology of the OEMs. The operators are given one day training in most cases. More clarity is needed in the duration and the knowledge imparted during such trainings. The trained operators did not have basic knowledge of how to take RPM readings or why it was relevant to the whole test. The authenticity of such a test is questionable.

Gurgaon: Out of the 10 PUCCs inspected only 4 had the certified operator present, the rest were tended by assistants who had no knowledge of the systems.

All 10 PUCC operators lacked any knowledge of the probe length, the RPM readings, the proper procedure to be followed.

In all PUCC centers the software was tampered with. Pre-set readings were fed into the system. When enquired of they were ignorant of how the data was preset, only stating that this is how their software works.

There is also an implicit non-compliance. When caught rigging the test by the team and asked to redo the test, the operator switched on the smoke opacity machine for the first time (A.K. PUCC).

Faridabad: Only two trained operators, out the 5 inspected, was found to be ignorant of the procedure to be followed. The rest were following the due procedure.

Rohtak: 10 PUCCs, in Rohtak, were chosen through a random selection process for the physical audit. The state of equipment in the inspected in 10 centres show show only one operator in 10 inspected centers had knowledge of the testing process. In 7 out of the 10 centers inspected the operator trained by the OEMs was not present and the test was conducted by an assistant instead.

Bharatpur: As stated earlier, none of the operators manning the PUC centers had undergone training to run the test or operate the software. The attending person had basic knowledge of the process: What all information is to be printed on the certificate, and the necessary inputs to be made in the fake software.

Alwar: None of the operators possessed a training certificate. In 80 per cent of the cases, there was no operator permit present, and in the rest of the cases, the person actually operating the centre was not the same as the person to whom the license had been issued.

Absentee Operator: In Rohtak for instance, only in three PUC centers had trained operators attending the center. In most cases the assistant conducted the test, with no knowledge of the testing process and the method of maintaining equipments.

Training programmes for operators have been found to be inadequate. It is not comprehensive training that is being imparted to the operators. Basic IT knowledge is the qualifying criteria so that the operators can operate the basic functions on a computer. The training programme of various OEMs last only for a day to 3 days. Uniformity will have to be maintained in this regard to ensure operators have full understanding of the physical as well as computer maintenance of the machines.

IX. Inspection framework of the RTOs

Licensing and certificates: The role of RTO is crucial for effective implementation of the PUC system. Issues of space and procurement of equipment can be assessed at the time of issuing licensing. This protocol however is not conducted with diligence as in numerous instances highlighted above, licenses are issued to PUC agencies who do not have a diesel testing machine and so forth do not display certificates. The local RTOs are yet to make it mandatory for all PUCCs to display their certificates.

The issue of absentee operator can be addressed by mandating display of certificates (AMC, type approval, training and calibration certificate). Thus anyone coming for PUC check can attest whether the person conducting their test is the trained operator or not

Delhi: All the operators said that transport department carries out time to time inspection, periodicity needs to be verified from the transport department. CPCB also carries out audits.

Rohtak: The licensing process in the Rohtak RTA, involves a formal application, with submission of documents of type approval, trainee certificate and agreement between the petrol pump owner and the PUC Licensee. The licensing Authority would then scrutinize the same and after a site visit would issue a license. The RTO stated that they conduct inspection every 6 months. This could not be validated from field.

Faridabad: The licensing process in the Faridabad RTA, involves a formal application, with submission of documents of type approval, trainee certificate and agreement between the petrol pump owner and the PUC Licensee. The licensing Authority would then scrutinize the same and after a site visit would issue a license.

The RTO has specific targets for each month. They have a dedicated team to conduct inspections of PUCs. They have a set of target of 5 centers in a week. Faridabad has seen fairly better compliance rate, when compared to Rohtak and Gurgaon, primarily due to the initiative of the local RTO

Faridabad has a very active system where the local RTO pushed for the PUCs in the region to get their hardware upgraded or their licenses would be revoked. This ensured the old hardware and broken machines were all replaced with new upgraded machines. The RTO also submit monthly report to the Chandigarh head office thus ensuring the data on PUC is regularly updated.

The compliance of the PUC agency is ensured by inspection by RTOs and the action on non-compliance is usually brought through verbal warning, suspension of license and as a penultimate revoking license.

Bulandshahr: Many of the PUC centres in this district were seen operating without any license, only one centre had the license but then it was an invalid one. Although there is a requirement for the operator to prominently display his license, operator's training, documentation of the emission analysis machines and other necessary certification, this was missing at all the centres audited. Such lack of compliance with the rules established by the state indicates a lackadaisical approach towards enforcement. Although there are "time-to-time inspections" of the PUC centres, such a state of non-compliance points towards these enforcement techniques being insufficient and inefficient.

Gautam Buddh Nagar: Two centres in the district did not have the license to operate. In the rest three centres all the certificates were displayed

Ghaziabad: The license was missing from most of the centres i.e., 8 out of 10 did not have licenses with them and neither they had a training certificates. In one case, the EPCA team even saw a blank pre-signed training certificate, which means that anyone can write their name on it.

Gurgaon: The licensing process in the Gurgaon RTA, involves a formal application, land is identified, a site check is conducted, and condition of the machine is ascertained. The licensing Authority would then scrutinize the same and after a site visit would issue a license.

The RTO officials in interview stated that they conduct regular periodic inspection every 2-3month. However their inspection method is rather suspicious as they choose to inform the PUCs beforehand when they conduct inspection rounds in their regions. They have been active in weeding out mobile pollution checking centers and have been effective in their efforts.

Bharatpur: In an interview with a local RTO, it was disclosed to the audit team that they conduct inspection only on receipt of a complaint. The RTOs approach PUC from an objective of generating revenue through fee levied on renewal of license and issue of license. The RTOs intervene only in cases of argument of pump owner.

The RTOS follow due procedure when issuing license, and have supplemented it by attending few provisions. The requirement of Diploma certificate of the operator and also the invoice of acquisition of machines by the licensee, is now mandatory in Bharatpur.

Rohtak, Gurgaon, Alwar and Bharatpur have no compliance strategy. They operate on a command approach. The enforcement system is solely based on ground inspection. The avenue of doing a review during renewal of license is lost, as data from the archives is not analysed neither is a site inspection carried through to check on state of machines, which are critical for the whole PUC system to give authentic results.

General problem faced in the region with the organization of the PUC centres

Display of certificates: It is still not mandated by the local RTOs to display the four crucial certificates (type approval, AMC, calibration and training certificate)

Log books: The PUCCs in all the three regions recently started maintaining log books (EPCA Format), it is still not made mandatory by the local RTO. The method used to maintain unofficial logs by the PUC operator is to maintain a customer care register where he only notes the vehicle number, date of check and mobile number to remind the customer of the renewal of PUC. The owner of the PUC center can collect the archival data from the software of the machine itself. But legitimacy of such logs can be questioned when most softwares do not support storing archival data.

Issue of space: Not all centers had space to place a vehicle for check. Often the stationary vehicle for inspection would be in the way of traffic or the vehicles coming in/going out of the fueling station. This would have been corrected if the site visit is conducted thoroughly before granting license. This is a discrepancy which points to lax inspection of the local RTO.

Renewal of License/ Re-inspections: Requirement of AMC of machines and type approval certificates are not mandatorily followed by Gurgaon and Rohtak, during granting of license. 5 PUCCs in Rohtak, one in Faridabad and 4 PUCCs in Gurgaon, did not have diesel machines but had recently renewed their licenses. The license was displayed at the PUCC of the same. The RTA officials clearly do not conduct site inspections before renewing the license. Such practices mean that the license continues to be in operation despite the machines not working, or in certain cases there not being a machine at all. *The type approval certificate is NOT a proof of acquiring a machine.*

Mobile Centers: In Gurgaon, when asked about the issue of mobile PUCCs, the RTO claimed that such mobile PUC units are illegal and that steps were taken to remove them from the region. Licenses have been cancelled and machines have been impounded, but the owners have not come yet to claim. The RTO stated that they do not grant license for mobile units as it is supposed to be "attached to the land". However the licensee may move it from the designated location in a petrol pump and sets it up as a mobile unit, without their permission.

In Uttar Pradesh cities all the operators said that transport department carries out time-to-time inspection. Some of the centres were inspected on the same morning in Ghaziabad on the day we visited the district.

Bharatpur, Rajasthan: The RTO in Bharatpur had stated that license to operate PUCCs were given without a rationale of number under the past administration, leading to a huge number of registered PUCCs in Bharatpur, half of which are not functional anymore.

The District Collector of Bharatpur in June 2016 had issued orders to filling station that fuel must be given to customers only on production of a PUC certificate. While this was to revive the PUC centers in the town, as there were no active inspection by the traffic police for PUC certificates from private vehicle owners. However it effectively led to windfall gains for the PUCCs all over the town as many centers issued fake certificates to capitalizing on the executive order. Over Rs. 92,000 was collected under this mandate.

Alwar: The main problem here as pointed out by the RTO as well was that there was little to no enforcement of PUC certification by the traffic police. This made PUC operations very difficult, and hence the centres were unable to operate as per procedure.

X.Challan and penalty for user of vehicles for non-compliance in NCR states

The official data on enforcement in terms of challans, penalty, inspection etc is still very inadequate.

As per the latest amended Central Motor Vehicle Act of 1988 under Section 190(2), for violation of road safety, noise and air pollution rules, the fine for first offence has been revised from Rs. 1000 to up to 3 months jail or Rs. 10000 or both, along with suspension of license for 3 months. For subsequent offences, fine has been revised from Rs. 2000 to up to 6 months jail or Rs. 10000 or both.

Only Uttar Pradesh government has shared a set of data on this matter.

Table 2 status of inspection and enforcement in UP cities in the NCR

Districts	Total number of PUC centres	Number of PUC centres inspected in 2016-17	No. of centres who followed the standard	No. of centres who flout the standard	No. of centres found close during the inspection
Ghaziabad	114	80	17	36	27
Gautam Buddh Nagar	72	65	44	-	21
Bulandshahr	48	48	33	15	15
Hapur	28	28	23	0	5

Source: Department of Transport, Government of Uttar Pradesh

The **Gurugram** RTO, also informed the EPCA team that they had impounded the mobile PUCs and other equipments which are yet to be claimed by the owners and till they do so they cannot register challan and hence do not have the quantified information on the same.

The inspection regime is also very weak. Gaziabad has only 9 inspectors, Gautam Budhh Nagar 7, Bulandshahr 2. The number of challans is a few hundred for the specified period. Clearly this renders the system more ineffective.

XI.Phase in centralized testing centres that are capable of conducting large volume of automated tests:

PUC tests can minimise the chances of cheating and manipulation only if automated test only centres are created where the test operator and the vehicle owner cannot come in contact. These can be introduced first for the commercial vehicles and subsequently the highly polluting segments of personal vehicles. Already there is a large vehicle fitness and inspection centre in Burari in Delhi and Rohtak in Haryana that can be immediately upgraded to carry out more upgraded emissions testing for commercial vehicles that have to obtain an annual roadworthiness certificate from these centres.

It is also important to review the options and provide the roadmap for upgrading the emissions testing procedures.

XII. India has already specified more advanced On Board Diagnostic Systems in post 2013 vehicles. This should be integrated with vehicle inspection programme for more effective monitoring:

If a problem or malfunction is detected, the OBD II system illuminates a warning light on the vehicle instrument panel to alert the driver. This warning light will typically display the phrase "Check Engine" or "Service Engine Soon," and will often include an engine symbol. The OBD system stores important information about any detected malfunction so that a repair technician can accurately find and fix the problem. It is notified to monitor catalyst, fuel Injection system, particulate trap, coolant temperature, EGR, fuel system, emission control systems, etc. Smog Check inspections in USA for

post 2000 model vehicles are now primarily based on an inspection of the OBD II system; Tailpipe testing is no longer required. Identifies emission-related components covered under warranty This eliminates unnecessary repairs; give information about area of malfunction or a specific component; this reduces cost of warranty repairs / customer satisfaction; allows early detection of malfunctions; and prevents malfunctions detect misfire before catalyst damaged etc. But this system will require strong surveillance and appropriate software to work effectively. In Europe OBD system often failed to detect high emissions from diesel cars.

Fault codes and other scan tool data give information about area of malfunction or a specific component.

OBD requirements in all positive Ignition Vehicles

Indian OBD I vehicles (April 1, 2010): Oxygen sensor, Secondary Air system, Coolant temperature, Exhaust Gas Recirculation, circuit continuity for all emission related power train components and Distance travelled since malfunction indicator lamp has been switched on.

Indian OBD II vehicles (April 1, 2013): Catalyst, Misfire, Oxygen sensor, Secondary Air system, Coolant temperature, EGR, Fuel tank leakage and evaporation, Fuel system, circuit continuity for all emission related power train components and Distance travelled since malfunction indicator lamp has been switched on.

OBD requirement in all Compression Ignition Vehicles

Indian OBD I vehicles (April 1, 2010): Fuel Injection system, Coolant temperature, EGR, Fuel system, Emission Control systems/ components, Circuit continuity for all emission related power train components and Distance travelled since malfunction indicator lamp has been switched on.

Indian OBD II vehicles (April 1, 2013): Catalyst, Fuel Injection system, Particulate Trap, Coolant temperature, EGR, Fuel system, Emission Control systems/ components, Circuit continuity for all emission related power train components and Distance travelled since MIL ON

XIII. Global action on OBD

US/California: Newer vehicles equipped with OBD II require an OBD check as part of their official Smog Check inspection. For newer there is no tailpipe inspection. For older model-year vehicles, the Smog Check include a tailpipe test and a visual inspection as well.

Germany: In Germany the Ministry of Transport used a clause in the EU directive which allows replacing the emission test by checking of the OBD. Very recently the minister of transport has announced to reintroduce the end of pipe emission test along with OBD as a back up to OBD not working properly.

The current practice of pollution under control programme (PUC) will have to be upgraded by integrating OBD monitoring to make it more effective and address new generation of vehicles.

XIV. Euro VI emissions standards needs different in-use compliance regulations – chart the roadmap for implementation:

It is important to note that BSVI emissions standards will bring much advanced emissions control systems in vehicles that cannot be monitored under the current PUC regime. For instance, diesel vehicles will be equipped with advanced particulate traps to reduce particulate emissions and also selective catalytic reducing system that uses urea solution to neutralize NOx in the exhaust emissions. Already global experience has shown how even after meeting the Euro VI emissions standards diesel vehicles are emitting six to 12 times higher emissions than their certification levels when they are on the roads. This has led to dramatic change in in-use compliance regulations in Europe that requires monitoring of emissions on board even as the vehicle is being driven on the road.

India has also adopted Real Driving Testing regulations as part of the BSVI emissions regulations. As this is a significant departure from the PUC regime and has no precedent and preparation on ground

EPCA would like to emphasise on the need to set the roadmap for its implementation to align with introduction of BSVI standards just in three years in time.

For the first time monitoring of real world emissions with portable monitoring system along with in-service compliance regulations will be implemented to keep an eye on real world emissions. Real driving emissions (RDE) testing will be included as an additional requirement for vehicle certification. Emissions measurements will be carried out with the help of Portable Emission Measurement System (PEMS) and onwards in-service conformity factor will be applied to ensure that emissions from vehicles remain within the stated margin. This can prevent emissions cheating and use of sub standards emissions control or defeat devices as was done by Volkswagen.

It is also important to note that PUC cannot screen inherent technical flaws and frauds for which manufacturers are responsible that compromise the emissions performance in the real world. For such anomalies consumers cannot be held responsible through the PUC regime. The fact that India is totally unprepared to prevent emissions frauds and underperformance of emissions control systems on roads was proved few years ago when the Tavera fraud case of General Motors was exposed. These models passed certification test with one set of engines that did not match those actually sold in the market. But this incident did not lead to any major reform to establish in-use compliance norms and monitoring in India. Indian government does not have the power to penalise the manufacturers for non-compliance and violation. This has serious implications as the next level of Euro V and Euro VI standards will require advanced particulate traps and NOx control systems like SCR to cut toxic diesel emissions. If engineering deficiency reduces effectiveness of these systems or if these are not properly operated like urea refilling in SCR system it can lead to uncontrolled emissions and nullify pollution control in cities.

XV. India needs strong compliance regulations to make manufactures responsible for on-road emissions performance for its useful life on road:

While developing the integrated framework for in-use emissions control from on-road vehicles it is also important to ensure that there are no inherent manufacturing defect that cause higher emissions and for which the consumers cannot be held responsible. Consistent with the global best practice India needs independent authority to check on-road emissions against standards; issue recall of vehicles by companies if they are found non-compliant; levy fines on defaulting companies; and withdraw approval of sale if vehicles do not conform with the stated emissions targets. An independent authority without the influence of the industry should monitor this process. Only such a system will make non-compliance with regulations more expensive for the companies than compliance with regulations and ensure implementation.

After the Tavera fraud case Government of India had set up the Nitin Gokarn Committee to assess the problem. This led to some reform related to the independent verification of new vehicle samples for type approval and certification for compliance with the of mass emissions standards in the laboratories. But now independent official systems are needed for testing of on-road vehicles to implement the vehicle recall programme if manufacturing defects occur.

In fact, China has taken steps to move in this direction. China has recently revised its programs to allow the selection of vehicles at random without any prior notice. Furthermore, COP testing in China is now corroborated through inter-laboratory round-robin testing, which adds an additional level of scrutiny.

It may be noted that the newly amended Central Motor Vehicles Act and Rule has provided for emissions recall which means if the emissions from a batch of vehicles is found to be higher for inherent manufacturing defect then the vehicle manufacturers will have to recall the entire batch of vehicles sold and fix it and return to the consumers. This needs to be implemented now.¹²EPCA recommends that this provision in the newly amended act needs to be implemented immediately.

¹² SIAM in its submission to EPCA has mentioned – Further, references to recall, in service, compliance in the present draft, are again not linked to PUC checking systems and needs to be removed.

Need defeat device regulations: It is a matter of concern that India has also fallen victim to Volkswagen fraud that had used a defeat or cheat device to beat emissions regulations. The ARAI has investigated this case in India¹³. The fact that the automobile market can be potentially vulnerable to such frauds immediate policy steps are needed to prevent use of defeat devices then the emissions benefits from the new fleet of vehicles expected to meet much more stringent emissions standards can be negated. It is evident from a review of Centre for Science and Environment that defeat devices are being sold openly in the global market. For instance, Adblue OBD2 Emulator that disables selective catalytic reducing (SCR) system needed to control NOx from diesel vehicles are being openly sold in the global market. People use this to avoid recurring cost of urea refill in SCRs. In countries like Brazil only 46 per cent of the diesel vehicles have working SCRs -- rest have been disabled. This highlights the risk for India. Thus, India needs defeat device regulations like other countries such as the US.

EPCA notes that an integrated approach is needed for reduction of in-use emissions from all on-road vehicles which is the objective of this current exercise. This requires a combined strategy of i) making PUC programme much more effective for the current on-road vehicles, ii) integrate OBD with PUC programme; iii) preparing for implementation of compliance regulations for BSVI vehicles in 2020 as the PUC cannot address that; and iv) implement manufacturers responsibility through a vehicle recall programme as mandated in the newly amended Motor Vehicles Act of 1988.

13 The ARAI has submitted the report on the investigation of Volkswagen fraud case to the Government of India. But this is not available in public domain. Further based on the recommendations of the Nitin Gokarn committee, several reforms such as changes in sampling procedure for COP testing etc. have been implemented.

6. Recommendations of EPCA

EPCA concludes that without a robust system of emissions monitoring and compliance, the investments in emission monitoring of on-road vehicles as well as advanced emissions control systems in new vehicles to meet tighter emissions standards, can go waste and negate air pollution control efforts in our cities. Management of emissions from on-road vehicles will require an integrated approach to ensure all generations of vehicles – old and new remain low emitting for as long as the vehicles are on the road.

This will require strengthening of the PUC systems for all on-road vehicles – Bharat stage (BS) I to IV generations of vehicles combining both physical tests as well as OBD tests. This will also require appropriate emissions monitoring system for the new generation of BSVI vehicles to come within three years. PUC will not be the relevant programme for that genre of vehicles. The BSVI standards and regulations have already provided for real driving emissions testing when vehicles move on the road. But the roadmap for its implementation needs to be charted quickly to allow Delhi and NCR to be prepared in time.

Simultaneously, the newly amended Motor Vehicle Act and Rules has given the opportunity to implement emissions recall programme so that the vehicle manufacturers can be held responsible for any manufacturing defect that increase on-road emissions. Both EPCA and Auto Fuel Policy committee had recommended emissions recall programme in 2003. Thus, addressing all the three element of the programme – PUC – both physical testing and OBD testing; real driving emissions testing for in-use compliance; and manufacturer responsibility for manufacturing defects, are the critical steps to get a robust system to keep vehicles low emitting on roads. This is needed for both consumers as well as manufacturers' responsibility. In view of this the following recommendations are made:

1. Limit the numbers of PUC centres, upgrade them and bring them under strong supervision and quality control:

The current practice of allowing mushrooming of small time and numerous PUC centres in refueling stations across the NCR must be stopped. It is more important to limit their numbers, upgrade their capacity to carry out proper credible and authentic testing and bring them within a strong accountability framework.

For improving compliance with the PUC programme, MoRTH and state transport departments should do the following:

2.1. Ensure 100 per cent compliance by linking annual vehicle insurance with PUC certificates.

Annual vehicle insurance cannot be obtained without all the requisite PUC certificates. Currently, PUC certificates need to be obtained every quarter in Delhi and every six months in the NCR. This periodicity of PUC certificate can be made uniform across Delhi and NCR later only after PUC norms and oversight systems have been adequately upgraded and stringent. Issue of authentic certificates must be ensured based on authentic and credible tests.¹⁴

2.2. Introduce automatic online network for transmission of PUC data to the central server to minimize manual interference and allow proper analysis of data for remote auditing of PUC centres.

Adopt uniform and standardized data recording and reporting format and uniform software across Delhi NCR.¹⁵ Mandate periodic analysis of data to refine enforcement and for monitoring and submission of compliance report every 6 months. Software used in different make of testing equipment across NCR needs to be standardized to prevent fake values. MoRTH needs to develop the standardized protocol for uniform application across Delhi-NCR.

¹⁴ The transport department, Govt. Of Rajasthan has suggested inclusion of security features such as QR codes for PUC stickers and water marks for determining authenticity of such certificates. It has also suggested an integrated QR Code and SMS based system to determine the PUC history of a vehicle.

¹⁵ The Transport Department of NCT Delhi in its submission to the EPCA has mentioned that – As EPCA proposed uniform common format for PUC data recording and reporting for both manual and automatic data recording system, common and uniform format may be made by MORTH, GOI, as it has prescribed the form and procedures.

2.3. Mandate pre-payment of PUC fees before the tests are conducted¹⁶. No test should be conducted without taking the fee in advance. The software should be modified accordingly.

2.4. Strengthen inspection of the PUC centres for quality control and strengthen the licensing programme to ensure proper calibration, authentic tests; annual maintenance contact for the maintenance of all testing equipment and accessories; training of operators, calibration of equipment etc are carried out. Make quality audit of centres and calibration quarterly. Introduce annual third party inspection of PUC centres immediately. State Pollution Control Boards with guidance from Central Pollution Control Board should coordinate this.

2.5 Phase in big centralized emissions testing centres capable of conducting automatic and upgraded tests for commercial vehicles on a priority basis. Delhi already has Burari vehicle inspection and fitness centre in Delhi for commercial vehicles. The commercial vehicles come here for annual vehicle fitness and roadworthiness tests. This needs to be upgraded for high level of automatic emissions testing so that operators and vehicle drivers do not come in contact to influence the test results and credible and upgraded tests are conducted. MoRTH is also setting up centralised inspection centres in NCR as in Rohtak. These should be aligned to firm up the roadmap. Add more such centres as needed.

2.6. Introduce well equipped mobile test centres and a programme to check visibly polluting vehicles: In addition to stationery testing centres, mobile units are also needed for surprise checks as well as to catch the visibly polluting vehicles on road. There should be appropriate penalty for visibly polluting vehicles.

Enforce stringent penalty for PUC centres for non-compliance and malpractices.

3. For improving the effectiveness of the PUC tests and inspection, MoRTH should do the following:

3.1. Tighten the PUC emissions norms for pre-Bharat Stage IV vehicles: Analysis of large data set on actual emissions concentration tested in large number of PUC centres in Delhi and UP has also brought out that the actual observed emissions values of pre-Bharat Stage IV vehicles are significantly lower than their prescribed norms. In most cases 80 per cent lower than the limits. These norms cannot identify at least 15 to 20 per cent grossly polluting vehicles in the on-road fleet. Nearly all vehicles pass the tests. Due to poor recording of failed tests and due to very lax norms the overall failure rate in Delhi is 4.69 per cent. For the diesel vehicles tested, the failure rate stands at 1.68 per cent, compared to 5.18 per cent for petrol vehicles and 4.65 per cent for all other fuel categories requires urgent attention and action. In UP NCR cities, the overall failure rate is abysmally low, at 0.49 per cent – 0.39 per cent in 2 wheelers and 0.59 per cent in four wheelers. The MoRTH needs to tighten the PUC standards for the pre-Bharat Stage IV emissions standards.¹⁷ This will also help to weed out very old non-compliant vehicles and speed up fleet renewal based on improved standards.

3.2. Overhaul emissions tests and tighten norms for diesel vehicles: The review of available data shows that the smoke density test – the only test that is carried out in diesel vehicles is very lax for the pre-Bharat Stage IV diesel vehicles. More than 80 per cent of vehicles tested show smoke density levels that are below the norm prescribed for the Bharat Stage IV vehicles. Therefore, the current norms for Bharat Stage IV norms should be made uniform for the pre-Bharat Stage IV vehicles as well. This can be further

¹⁶ The Transport Department of NCT Delhi in its submission to the EPCA has mentioned – Mandate pre-payment of PUC fees before tests are conducted.

¹⁷ The Transport Department of NCT Delhi in its submission to the EPCA has mentioned that – regarding poor failure rate, emissions standards may be tightened by the MORTH, GOI, as proposed by EPCA. For diesel vehicles prescribed emissions standards should be uniform for pre Bharat Stage IV and for Bharat Stage IV both and proposed by EPCA for further tightening to 40 HSU. It comes under the purview of MORTH, GOI.

tightened to 40 HSU¹⁸ which is the global best practice. Tighter norms will help to weed out the very old and polluting vehicles and speed up fleet renewal.

Moreover, as explained earlier globally smoke tests are being upgraded with more advanced test procedures to make these tests more rigorous and effective. MoRTH may review those advanced testing procedures and provide a roadmap for the introduction of these tests in the large centralized testing centres for commercial vehicles quickly.

3.3. Make lambda test for petrol cars mandatory across NCR: Lambda testing for petrol cars equipped with three way catalytic converters – introduced in BSII-III level is already mandatory in Delhi as per the MORTH 2004 notification, but not in NCR. Lambda value represents the air to fuel ratio. It is important to maintain the optimum ratio for proper functioning of the catalytic converters that play a crucial role in cleaning up the exhaust gases from petrol cars. It is not possible to directly test the efficacy of the catalytic converters. That is why it is important to ensure that the operative systems in the vehicles needed for its optimum performance are maintained. Lambda is an indicator of that. Such tests will require upgradation of the test equipment from two gas analysers to four gas analyzers capable of doing lambda testing. Petrol cars are already tested for carbon monoxide, hydrocarbon based on two speeds. If done along with lambda measurement, the test procedures for petrol cars can become more robust and effective. As the MoRTH has already provided for lambda tests in its 2004 notification, the concerned state governments need to issue orders for implementation in the NCR.

3.4. Integrate OBD with inspection and maintenance programme: The MoRTH needs to develop the protocol for implementation of OBD for vehicle inspection programme that will be implemented by the state governments. This will complement the physical testing.¹⁹ It is also important to detail out how this will be operationalised at the ground level and how the transport department will implement this programme.

3.5. Detail out the strategy for advanced real driving emissions monitoring of new generation vehicles to come with BSVI emissions standards in 2020: Any roadmap for improving vehicle inspection programme at this juncture will have to keep in view the dramatic transition in emissions control technologies within a short span of three years when BSVI emissions standards will be enforced. The current PUC is not designed to address those vehicle technologies. The notification of MoRTH on BSVI standards has already provided for the introduction of Real Driving Emissions Test Procedures and Standards based on portable emissions monitoring system to monitor emissions as vehicles move on the road. This is needed to ensure that all the advanced emissions control devices that to be fitted in the new vehicles will continue to perform effectively in real world.

This has become necessary in view of the rapid deterioration in emissions noted in new Euro VI vehicles in Europe and the US and also to prevent use of defeat devices to cheat emissions standards. The data available from Europe shows that the actual NOx emissions from Euro VI diesel cars can be as bad or worse than a Euro I diesel car as on-road emissions can be as higher as upto 16 times higher than their certification level (see Graph 1: NOx emissions from Euro-VI diesel cars on road in Europe are emitting several times higher than certification level). EPCA strongly believes that as India is now making this crucial transition to a very advanced genre of vehicles proactive and preventive policies and systems should be put in place to these advanced systems continue to perform efficiently on road

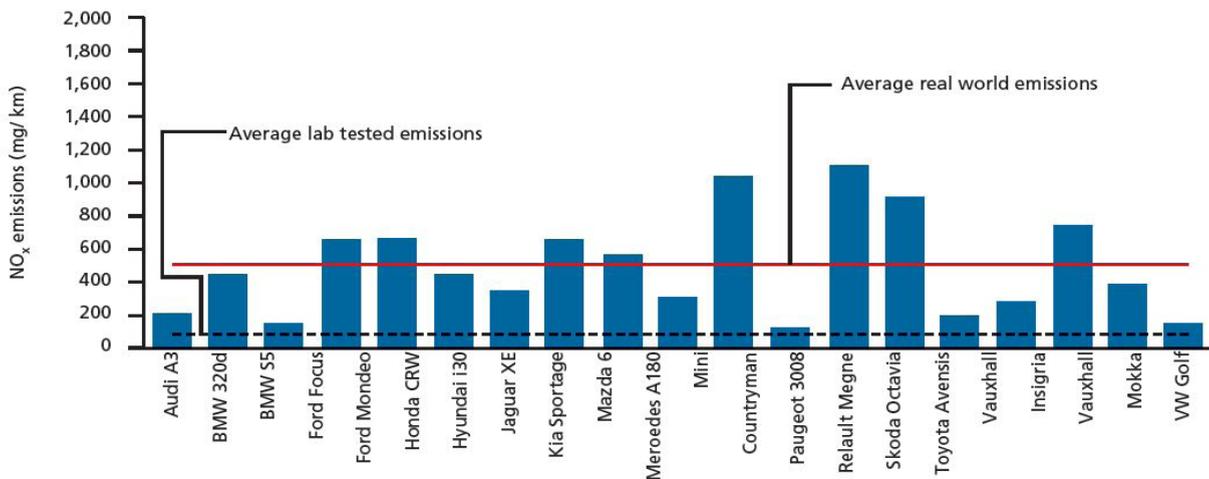
18 SIAM has mentioned in the meeting held on April 19, 2017 that 40 HSU for all diesel vehicles may not be appropriate as some of the older vehicles were not designed to meet this level. However, EPCA is of the view that standards should be stringent enough to identify and weed out the old and gross polluters. This will also help with rapid fleet renewal. Also Government of India is framing a scrappage policy for the old commercial vehicles that will further help to eliminate very old and polluting vehicles. It is also important to label the vehicles according to the mass emissions standards especially the older vehicles. This will subsequently help to regulate the older and polluting vehicles better.

19 Department of Transport NCT Delhi in its submission to EPCA has stated that regarding integrated OBD with inspection and maintenance programme, Ministry of Road Transport and Highways, Government of India, need to develop the protocol for implementation of OBD for vehicle inspection.

and all generation of vehicles remain low emitting during their useful lifetime.²⁰ MoRTH along with the state governments of the NCR-Delhi need to put in place the systems for introduction of Real Driving Emissions testing for BSVI vehicles.

Graph 11: NOx emissions from Euro-VI diesel cars on road in Europe are emitting several times higher than certification level

Continues to exceed norms by several times



Source: Secretary of State Transport, UK

Implement emissions recall programme to make vehicle manufacturers responsible for manufacturing defect and introduce regulations to prevent use of cheat and defeat devices to reduce emissions on road.

²⁰ Department of Transport NCT Delhi in its submission to EPCA has stated that regarding to introduction of Euro VI emissions standards in 2020 and requires introduction of Real Driving Emissions Test Procedures and Standards based on portable emissions monitoring as vehicles move on the road comes under the purview of the MORTH, GOI.

Annexure 1: Emission standards for various categories of vehicles, as per the Central Motor Vehicles Rules, 1989

Table: Emissions standards for petrol vehicles

For Petrol Vehicles		
1. Two / three wheelers		
	CO in %	HC in parts per million (ppm)
Pre 2000 (2/4-stroke)	4.5	9000
Post 2000 (2-stroke)	3.5	6000
Post 2000 (4-stroke)	3.5	4500
2. Passenger cars		
	CO in %	HC in ppm
Pre BS II cars	3.0	1500 *
BS-II, BS-III cars	0.5	750
BS IV Petrol cars	Idle 0.3 High idle 0.2	Idle 200
BS IV CNG/LPG cars	Idle 0.3	Idle 200
BS IV Petrol cars lambda test	1+/-0.03 or as declared by vehicle manufacturer	
Note: * For CNG vehicles non methane hydrocarbon = 0.3 X HC; For LPG vehicles Reactive hydrocarbon = 0.5 X HC		

Table: Emission standards for diesel vehicles

	Maximum Smoke Density	
	Light absorption coefficient (1/metre)	Hartidge Units (HSU)
Pre-Bharat Stage IV compliant vehicles	2.45	65
For Bharat Stage IV compliant vehicles	1.62	50

The gasoline/CNG/LPG vehicles are tested for CO and HC emissions, and lambda values and the diesel vehicles are tested for HSU emission. The standards for in-use vehicles in India were prescribed under Rule 115 (2) of Central Motor Vehicles Rules 1989, under the Motor Vehicles Act 1988. Revised PUC norms for in-use vehicles were notified by Ministry of Road Transport and Highways, Government of India, which were implemented across the country from October 1, 2004. Gasoline/LPG/CNG vehicles are tested on idle speed testing mode and diesel vehicles are tested on free acceleration mode (FAS).

Free Acceleration Test for Diesel Vehicles

The free acceleration test shall be carried out using meter type-approved under sub-rule (3) of rule 116 as given under:-

- three times flushing by free acceleration to be undertaken with or without the sampling probe in the vehicle exhaust, and average maximum rpm of the three flushings to be recorded;
- thereafter, with sample probe inserted in vehicle exhaust during each free acceleration, maximum no-load rpm reached shall be within the bandwidth of ± 500 rpm of the average value in respect of 3-wheeled vehicles and ± 300 rpm of the average value for all other categories of vehicles;
- the free acceleration test, mentioned in (b) above, shall be repeated minimum three times;
- the smoke density to be recorded shall be arithmetic mean of these three readings;

(e) In case the smoke density recorded is not within the limits, then, the test may be repeated with engine oil temperature measured by a probe in the oil level dipstick tube to be at least 60° C:

Provided that the above test shall not be carried out if the On Board Diagnostic (OBD) Malfunction Indicator Lamp (MIL) of BS-IV vehicles is switched on; in such cases, the vehicle shall be re-submitted for the above test after repair or servicing:

Provided further that only for Type Approval purposes, all new models type-approved on or before the commencement of the Central Motor Vehicles (Tenth Amendment) Rules, 2015 and complying with the requirements of free acceleration smoke as provided in the Central Motor Vehicles (Amendment) Rules, 2012, published vide notification number GSR 103(E) dated 23rd February 2012, need not be re-type-approved for compliance to this subrule.”

Annexure 2: Photo Documentation of field audit to various NCR cities

Photo documentation of malpractices in PUC centres during field investigation in Delhi and NCR

1. Improper Testing:



PK PUC, Gurgaon
Centre code- GGN P0234

In this centre, diesel car was checked with a petrol probe, despite having a diesel probe. Circle in blue is petrol probe being inserted in exhaust pipe and circle in red shows the diesel probe.



Narendra Prayavaran Sewa Samiti, Bulandshahr,
Centre code- 687

A fake PUC certificate was issued for the decoy diesel vehicle by the PUC centre which did not have any test equipment.



Chaman Prayavaran Sewa Samiti, Anoopshahr,
Bulandshahr,
Centre code- 908

There was no testing equipment in this centre at the time of inspection. It only had a computer and printer for issuing PUC certificate.



Dev Raj PUC, Rohtak,
Centre code- RTKD-0080

Broken non-functioning testing equipment was a common sight across Rohtak. This is Dev Raj PUC centre where the smoke meter was not connected to the computer. However, it still issued a pass certificate with mean readings of flush cycles.



Indrsuddha Associate PUC, Faridabad, Centre code-
FBDD0061

This PUC centre had a non-functioning diesel smoke meter. The centre still issued a pass certificate.



M/s. Nida Welfare Society, Bulandshahr, Centre code- P614/ D849

Copper probe for petrol vehicle was missing. So the tube was directly inserted into exhaust pipe



Nature Paryavaran Samiti,
Gautam Buddh Nagar,
Centre Code- 832

The measurement probe was not properly inserted into the exhaust pipe and was also broken. Copper probe was absent.



Vardhman Petroleum, Ghaziabad,
Centre code- 902

There was no proper probe and only rubber tube was available. Diesel probe was broken and leaking, yet the operation continued normally



In Rewari district, fake PUC centres were seen operating out of empty handcarts on NH-8 that did not have emission analysers or computers.

2. Fake certificates:

Vehicle Rejection Slip

Center Name Anand Service Station
 Center Address Mahipal Pur, Gurgaon Road, ND-37
 Puc no RD191000810
 Vehicle No DLYC3048

Vehicle Make	TATA MOTORS LTD	RPM Min.	711	RPM Max.	3727	
Vehicle Model	Motor Cab	S.No	RPM Min	RPM Max	HSU Km	Temp
Vehicle Type	CAR	1.	746	3681	51.9	1.70 112
Mfg.	03/2011	2.	753	3774	68.6	2.69 113
Fuel Type	DIESEL	3.	753	3681	55.1	1.84 114
Test Date	15-03-2017	4.	750	3750	71.8	2.94 115
Test Time	10:32:14 AM	5.	746	3681	68.8	2.70 115
		6.	704	3750	64.9	2.43 116
		7.	714	3774	72.2	2.97 116
		8.	723	3726	57.3	1.97 116
		9.	707	3774	70.9	2.87 116
		10.	742	3646	42.8	1.29 116
		Mean		Fail	60.8	2.17

1235
 प्रदूषण नियंत्रित प्रमाणपत्र
 POLLUTION UNDER CONTROL CERTIFICATE
 परिवहन विभाग, दिल्ली सरकार द्वारा अधिकृत
 TRANSPORT DEPARTMENT, GOVT. OF DELHI

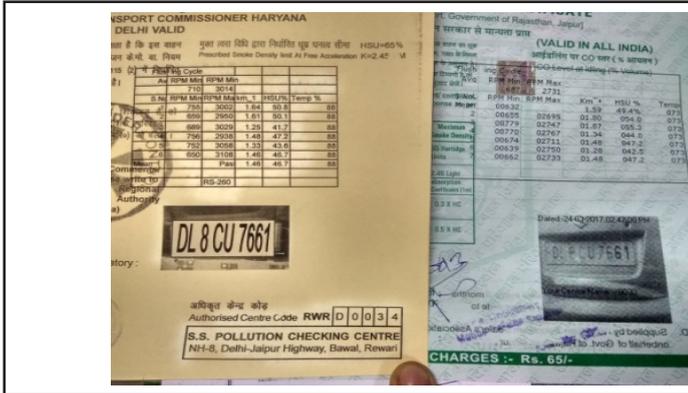
PUC NO. DLYC3048
 DL-2850/224
 TATA MOTORS LTD
 Motor Cab
 03/2011
 DIESEL
 15-03-2017
 11:30:50 AM

S.No	RPM Min	RPM Max	HSU Km	Temp
1.	710	2820	47.2	1.49 98.00
2.	710	2780	47.4	1.49 95.00
3.	740	2650	46.9	1.47 95.00
4.	750	2660	46.8	1.47 96.00
Mean		Pass	47.0	1.48

Authorised Signatory
 राजस्थान फिलिंग स्टेशन
 Rajasthan Rajpath Filling Station
 Khasra No 4, Delhi-Jaipur NH-8,
 Samat Khia, New Delhi-110037
 (Noker Rajokarun Red Light)
 (S. Tax Extra 15%)
 Prescribe Pollution Checking Charges : Diesel Charge = Rs. 100/- S. Tax No : AAGFR5391FSD0001

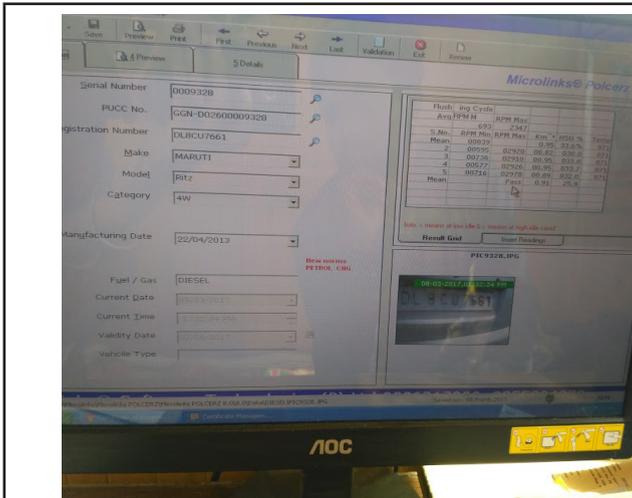
A car was taken for decoy testing to first Anand service station (code P 276) Mahipalpur, Delhi where the BSIV vehicle recorded 60 HSU which is much higher than the norm of 50 HSU. Thus, it failed. But the same vehicle when taken immediately to Rajasthan Rajpath Filling Station (Khasra No 4, Delhi-Jaipur Road, NH8 Samajha) it recorded 47 HSU and it passed.

Delhi



In Rewari, the PUCC deployed fake software, which generated readings and allowed entering license plate number in the license plate image, creating a pass certificate looking similar to an authentic certificate.

3.Fake software:



Vishesh PUC, Gurgaon
Centre code- GGNP02997

The image shows fake software called "certificate management programme". The diesel-testing equipment was turned off when the operator showed these readings claiming them to be the results of the EPCA audit vehicle. This is a common software found across PUC centres in Haryana.



Narendra Prayavaran Sewa Samiti, Bulandshahr,
Centre code- 687

Fake software allows operator to choose from list of vehicles having different pre-set values for RPM and emissions values which is independent of date of manufacturing of the vehicle.



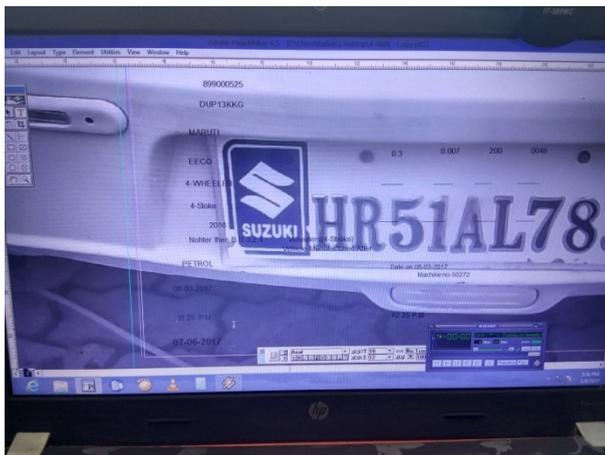
Alora Service Station, Bharatpur,
Center code- D51

The testing software gives an option to "generate readings", with a drop down option for car models. Also, it allows selection of the minimum and maximum RPM values.



Kamlesh Welfare Society, Bulandshahr, Centre code- 1190

This image is of software that asks in a pop-up box, "Press 'Yes' to Pass and 'No' to Fail."



Durga Sewa Sansthan, Bulandshahr,
Centre code- 899

The Adobe Page maker and photoshop was used in this centre in Bulandshahr to manipulate and print of PUC certificates.

Annexure 3: ARAI PUC Center Audit Format

PUC Center Audit Format

Date : _____
City : _____

Date of Updation : 1 Dec 2009

1.0 PUC Center

Name	[Redacted]	
Address	[Redacted]	
Name of the Center Owner / Representative	[Redacted]	
RTO License Number	[Redacted]	
License Validity	[Redacted]	
AMC Details and Validity	[Redacted]	
Is Copy of Type Approval Certificate Displayed	Yes	No
Are copies Training Certificates of Operators displayed	Yes	No
Is the Mask and Ear Plug available for the test operator ?	Yes	No
Is sufficient space available for testing all types of vehicles ?	Yes	No

2.0 PUC Test Operator

Name	[Redacted]	
Qualification	[Redacted]	
Training Details	[Redacted]	
Is the understanding of Measurement Test Procedure Correct	Yes	No
Is Mask and Ear Plug used by Test Operator	Yes	No

3.0 PUC Equipment (Gas analyser)

Model Name of the Instrument	[Redacted]	
Manufacturer / Supplier	[Redacted]	
Whether Type Approved ?	Yes	No
Is Instrument Calibrated ?	Yes	No
Calibration Report No. and Date	[Redacted]	
Is Sample Handling Leak Proof ?	Yes	No
Are Extension Pipes available ?	Yes	No
Is the Probe length sufficient (-> 30 cm)	Yes	No
Is the Instrument Pump working ?	Yes	No

PUC Center Audit Format

Date : _____
 City : _____

Are the filters cleaned and working condition ?

Yes	No
-----	----

Test software logic as per type approval specifications ?

a. Leak Check (Always on Power ON)

Yes	No
-----	----

b. HC Residue
 (Always on Power ON and Before every measurement)

Yes	No
-----	----

c. Low Flow

Yes	No
-----	----

Is the RPM Measurement facility provided ?

Yes	No
-----	----

4.0 Test Results

	RPM	CO%	HC ppm	CO2 %	O2 %	Lambda	
						Indicated	Calculated
Idle							
High Idle							

5.0 PUC Equipment (Smoke meter)

Model Name of the Instrument

Manufacturer / Supplier

Whether Type Approved ?

Yes	No
-----	----

Is Instrument Calibrated ?

Yes	No
-----	----

Calibration Report No. and Date

--

Is RPM sensor provided ?

Yes	No
-----	----

Is Oil temperature sensor available ?

Yes	No
-----	----

Is the GO / NOGO guage provided for fuel Injection pipe dia measurement?

Yes	No
-----	----

Test software logic as per type approval specifications ?

a. Requirement of 60°C oil temperature Cut-off

Yes	No
-----	----

b. RPM measurement during the flushing cycles

Yes	No
-----	----

c. Smoke results are verified for validity

Yes	No
-----	----

PUC Center Audit Format

Date : _____
 City : _____

6.0 Test Results

	Min RPM	Max. RPM	Oil Tem.	SMOKE
Pushing Cycles	1			
	2			
	3			
	4			
	5			
	6			

Actual Measurement	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			

AVG				
-----	--	--	--	--

7.0 Remarks

8.0 Points to be verified in next Audit

9.0 Photographs

Yes	No
-----	----

Signature of PUC test Center
 Owner / Representative

Signature of Audit Team

Annexure 4: Comments received from SIAM on March 18, 2017

Dear Mr Tiwani,

Based on the quick study of the draft EPCA report No. 71 on the Pollution under Control Centre (PUCC) Inspection of Delhi and NCR districts by SIAM, we have the following preliminary observations:

1. Since the Hon'ble Supreme Court has sought response with regard to the functioning of the PUC Centres in NCR, the report of EPCA, as rightly brought out in many places, should highlight the noted shortcomings and suggest possible ways to improve their performance.
2. With regard to the references to Real Driving Emission test procedures, which has been notified by Government of India for introduction, after BS VI Emission norms are implemented, SIAM would like to highlight that these tests are done on new vehicles for Type Approval purposes and these tests cannot be done by the PUC Centres. Hence, reference to Real Driving Emissions in various sections of this report needs to be removed, as it would be not in the scope of PUC testing.
3. It has been mentioned in the Draft report that CSE's review has shown that the testing by certification agencies (for new vehicles), compromises independent and impartial testing, as vehicle samples are not collected randomly. This is incorrect, as there is a detail procedure for Conformity of Production of new vehicles, which addresses among several other things, randomness for selecting vehicles for testing. Moreover, this section again has no direct linkages to the operation of the PUC Centres and hence needs to be removed from this document.
4. Further, references to recall, in-service compliance in the present draft, are again not linked to PUC Checking systems and needs to be removed.
5. The report is focusing on the need to tighten the PUC norms, whereas focus has to be more on the implementation of the norm. It must be recognized that implementation of the already notified PUC norms is a bigger problem.
6. As rightly pointed out in the report, controlling proliferation of fake softwares, lack of required equipment and facilities, lack of qualified and skilled PUC Operators are issues directly linked to PUC operation and needs to be addressed at the earliest.

In case there are additional comments on the draft report, we would send the same in due course.

Kind regards,

Vishnu Mathur
 Director General
 (Sent from email id of Mr Atanu Ganguli)

Annexure 5: Comments received from the Department of Transport, Government of the National Capital Territory of Delhi on March 17, 2017

Latest EPCA report in the matter of WP(c) No.13029 of 1985, M.C. Mehta Vs. UOI and Ors. for providing comments.

- Regarding cheating and mal-practices noticed by the inspection team. This department is also conducting the inspection of PUC centres and taking action appropriately.
- As EPCA proposed uniform common format for PUC data recording and reporting for both manual and automatic data recording system, common and uniform format may be made by the MORTH, GOI as pre-scribed the forms and procedures.
- Mandate pre-payment of PUC fees before the tests are conducted.
- Regarding poor failure rate emission standards may be tightened by MORTH, GOI as proposed by EPCA for diesel vehicles pre-scribed emissions standards should be uniform for pre-Bharat Stage IV and for Bharat Stage IV both and proposed by EPCA for further tightened to 40 HSU. It comes under the purview of MORTH, GOI.
- Regarding integrated OBD with inspection and maintenance programme, MORTH, GOI need to develop the protocol for implementation of OBD for vehicle inspection.
- Regarding to introduce Euro VI emissions standards in 2020 and requires introduction of Real Driving Emissions Test Procedure and Standards based on portable emissions monitoring emissions as vehicles move on the road comes under the purview of MORTH, GOI.

Annexure 6: Comments received from the Department of Transport, Government of the Uttar Pradesh on March 26, 2017

Directive of the Hon'ble Supreme Court and Scope/objective of the review and inspection	U.P. Transport Department Comments
<p>1. Directive of the Hon'ble Supreme Court The Hon'ble Supreme Court in its order dated January 17, 2017 and February 6, 2017 has directed the Environment Pollution (Prevention and Control) Authority for Delhi NCR (EPCA) to inspect Pollution Under Control (PUC) Centers located in the NCT of Delhi and also those in the districts of the NCR. The court has directed EPCA to submit the status report by mid-March, 2017. The directives from the Hon'ble Supreme Court are as follow: Hon'ble SC order dated January 17, 2017: "We expect a final, proper and accurate response with regard to the functioning of the PUC Centres after a thorough inspection of each one of them. We are told by the learned amicus curiae that the inspection will take about eight weeks." Hon'ble SC order dated February 6, 2017: "It has been brought to our notice that earlier an order was passed by this Court on 02.12.2016 and 25.11.2016 relating to setting up of Pollution Under Control Certificate (PUC) Centres in Delhi. We request the EPCA to expand the scope of its study by including PUC Centres not only in Delhi but also in NCR and submit a status report, as earlier directed, by mid-March, 2017." In response to the directives from the Hon'ble Supreme Court, EPCA has carried out physical inspection of a random group of PUC centres and reviewed the effectiveness of the programme to chart the roadmap for improvement of the vehicle inspection programme. This is needed to keep the on-road vehicles low emitting during their lifetime and deliver on clean air objectives. The scope and objective of the review and inspection are as follow.</p>	<p>The order of the Hon'ble Supreme Court in the matter of write petition (c) No. 13029 of 1985:, M.C. Metha V/S Union of India and others, The Directions given by the Supreme Court on dated 17-01-2017 and 06-02-2017 have been quoted for a random physical inspection by a group constituted by E.P.C.A. so as to inspect physically to P.U.C. Centers and review its effectiveness and delivering on clean air objectives.</p> <p>Comment- In the view of above no comment is required for the Department.</p>
<p>i. Assess the level of compliance with the programme: It is important to understand how many vehicles actually turn up for regular PUC tests to comply with the programme; how many vehicles pass or fail the tests; and their emissions concentration vis a vis the PUC norms. Functioning of the PUC centres have direct bearing on these factors. EPCA has obtained PUC emissions databases from the transport departments of the state governments in the NCR region for this purpose. The available dataset has been analysed to understand the effectiveness of the programme.</p>	<p>Comments-Scope and objective of the review and asses the level of the compliance of the programme the stand proposed by the group is correct and we are of the same opinion.</p>
<p>ii. Physical inspection of the PUC centres to check if credible, authentic and reliable tests are being conducted to identify gross polluters. The EPCA has formed several teams of volunteers who were trained by the officials of the Central Pollution Control Board. The teams visited and audited the PUC centres in Delhi and other cities and towns of NCR. It may be noted that given the very large number of decentralized small PUC centres across the region it has not been possible to aim for 100 per cent coverage of all centres for inspection in the given time frame. For example, there are 971 PUC centres in Delhi alone and several hundred in NCR towns that are located in small sheds in petrol pumps. Therefore, EPCA has carried out a rapid and diagnostic assessment to understand what ails the system. In doing so EPCA has also kept in view its earlier assessment of the PUC programme that was done for the Hon'ble Supreme Court in 2003. That had revealed several systemic problems with the programme. The new assessment shows that while several of the systemic problems have continued newer challenges have emerged in the meantime in terms of in-use emissions from different genre of on-road vehicles. This will have to be addressed for a robust vehicle inspection programme in Delhi NCR. If not addressed immediately then an extremely weak and ineffectual programme will be perpetuated. The teams have audited the centers on the basis of "Code of Practice" prepared by the ARAI (Automobile Research Association of India) with some additional questions (Annexure 1,1A & 1B). PUC centres were randomly selected to find answers to the critical questions related to the effectiveness of the programme.</p>	<p>Comments-The group as emphasized several of the systematic problems continuing never challenges emerged in the present in terms of in-use emissions for different type of on road vehicles The group have addressed for proper inspection programme in Delhi and N.C.R. Such Action urgently required and to be implemented.</p> <p>The team also of the view that "Code of Practice" prepared by the A.R.A.I P.U.C. Centers where lagging test operates for correct test procedure, all the requisite test equipment and accessories and etc. These are the comments of the team after randomly selectly P.U.C centers and we are also in agreement with the opinion which persisting and for improving necessary action are being taken in time bound</p>

<p>The physical inspection has gathered information on --- whether test operators are following the correct test procedures; if the test operators have all the requisite test equipment and accessories; data logging procedure and performance of software; level of knowledge of test operators and compliance with the regular calibration of equipment. Several questions emerging from the field were also followed up with the RTOs. (See Table 1 on the basic details of PUC centres inspected by EPCA in NCR cities).</p>	<p>manner. Necessary instructions have already given to the respective officers of the department falling in the districts of UP of NCR.</p>
<p>iii. Evaluation of the PUC emissions databases to assess their usability to inform enforcement and monitoring. The data bases on actual emissions results from the PUC centers that were shared by the state governments have been analyzed to see if PUC centers follow robust protocol for data recording and data management to help in auditing of the PUC centers and also to provide feedback for upgrades of the programme. In fact, poor quality of PUC data bases has restricted the scope of this assessment. This requires immediate improvement.</p>	<p>The report indicates that evaluation of PUC databases to access their usability to inform enforcement and monitoring is not found proper and poor quality of PUC databases has restricted the scope of this statement. The report also suggests on this point for immediate improvement.</p> <p>Comments- Instructions for improvement to the respective officers have already being sent but it appears that the instructions are not being followed by the officers in the letter and spirit, hence strict instructions are being sent for immediate improvement.</p>
<p>iv. Adequacy of PUC norms according to different generation of vehicle technologies meeting different mass emissions standards was assessed: Actual emission concentration data from PUC testing reported by the state governments were analysed to check the actual pollution performance of different genre of vehicles on roads and how do they compare with the PUC norms. While this has helped to understand the rate of pass and fail it has also helped to understand adequacy of the current norms and if they are designed to match the level of vehicle technology meeting different mass emissions standards of Bharat Stage I,II, III, and IV. This assessment has been done for the norms for petrol as well as diesel vehicles to understand the kind of revision that is needed.</p>	<p>Comments-We are in agreement by the suggestion given by the group regarding P.U.C. Centers.</p>
<p>v. Assessment of official system of inspection and licensing of PUC centres for quality control and to ensure credible and authentic tests are being conducted. Only setting up numerous small centres without the ability to do good quality control and put in place an effective oversight system to audit the centres can compromise the effectiveness of the programme</p>	<p>Comments-We are in agreement by the suggestion given by the group.</p>
<p>vi. EPCA has also assessed new challenges in controlling in-use emissions from new generation of vehicles on-road to chart the future roadmap for vehicle inspection programme: EPCA has taken into consideration the fact that since the last report on PUC programme that was submitted to the Hon'ble Court in 2003 the vehicle technologies have undergone substantial changes due to improvement in mass emissions standards. Also within the next three years Euro VI compliant vehicles will be introduced with much advanced emissions control system that will also require more advanced emissions monitoring that the current PUC programme will not be able to address. This will require more advanced emissions monitoring system. This roadmap will have to be charted now to be prepared in advance.</p>	<p>Comments-In view of Euro-VI compliance vehicles are to be manufactured from 01-04-2017 and after, which has been mandated by the Govt. of India by changing C.M.V.R 1989, hence the group report provided about requirement of more advanced emission monitoring system will be necessary. We are in agreement of the group report.</p>
<p>vii. Based on this assessment key recommendations have been made to address the current weakness of the PUC programme and to chart the future course of action</p>	<p>No Comment is required here, point wise comments have been given at the appropriate positions.</p>

<p>1.2 Summary of observation of EPCA based on the review and physical inspection of the PUC centres</p> <p>This report has detailed out the key findings of the review and assessment. The summary observations are as follow.</p> <p>Problem of quality control and assurance:</p> <p>The overall assessment has revealed there are serious quality concerns in the way PUC tests are conducted and equipment are maintained in numerous PUC centres across the NCR region. Malpractice is evident and noticeable. One of the reasons is the way PUC centres are organized. These centres are numerous, small and decentralized with very weak regulatory oversight. It is very difficult to inspect and monitor all of them. In Delhi alone there are 971 centres but the transport department has only 28 inspectors to inspect all of them. In NCR towns the number of inspectors varies between 2 to 9 where as PUC centres are in two digits to more than 100 in one town. Thus, only tinkering with the current system will not provide the full solutions. Over a period of time small steps have been taken in Delhi to improve the system with some results but it continues to remain plagued with problems. This needs more systemic solutions. EPCA notes with serious concern rampant cheating and malpractices that have been noted by the inspection team in PUC centres in the region. This includes use of fake software, issue of false passes, inappropriate tests. Details of these malpractices have been included in the main report. In fact out of 12 lakh emissions data that have been analysed for Delhi nearly 20 per cent of tests have recorded zero values which is impossible. This casts serious doubts on the efficacy of the programme and the licensing system. Unless this programme is fully re-engineered this can deteriorate to doing nothing.</p>	<p>Comments-We are in agreement of the group report regarding the quality control and assurance in U.P. Also more than 900 P.U.C. Centers have been established. Which are having valid license but monitoring system is poor. There is no connectivity with the machine of the P.U.C. centers and certainly this requires immediate attention . Instructions have been sent to the concerned field officers, which is yet to be repeated so as to control the problem of quality.</p>
<p>Poor compliance with the programme:</p> <p>This analysis has once again revealed that the transport departments do not have clear information on how many vehicles turn up for tests. An indicative assessment for this report based on the data on total number of tests carried out in one quarter in Delhi shows perhaps just about 23 per cent of vehicles have turned up for tests. This needs a very strong tracking as well as a solution to ensure 100 per cent compliance. This is a poorly enforced programme.</p>	<p>Comments-Poor compliance with the programme and needs a very strong tracking and as well as a solution to insure 100 percent compliance. Instructions have been sent to the concerned field officers and being repeated again.</p>
<p>Poor failure rate – nearly all vehicle pass:</p> <p>Even among those vehicles that turn up for tests the failure rate is very low – in Delhi only 1.68 per cent of diesel vehicles fail the smoke density tests and about 4.5 per cent of the petrol vehicles fail the carbonmonoxide and hydrocarbon tests. Thus, this programme is not even designed to catch at least 15 to 20 per cent most grossly polluting vehicles in the fleet. One serious flaw is the fact that failed tests is not recorded as vehicle owners refuse to pay the test fee if their vehicles fail. As a result, the pass - fail data compiled by the transport departments show very poor failure rate. Lax norms and malpractice also contribute to this trend. It is therefore, important to mandate advance payment of fees before the test is conducted and the software should be changed accordingly to plug this loophole.</p>	<p>Comments-We also agree with the study of the group, it is therefore important to mandate advance payment of fee before the test is conducted and softer should be changed accordingly to plugged loophole.</p>
<p>Lax PUC norms:</p> <p>Poor failure rate is not only a reflection of poorly done tests and poor data keeping. It is also a reflection of very lax PUC norms that rarely fail the vehicles. EPCA notes with great concern that the current PUC norms are so weak especially for the pre-Bharat Stage IV vehicles that dominate the fleet in our cities. Not only most vehicles pass the test but a great part of them actually pass the test with as high as 80 per cent margin from the norm. This calls for immediate tightening of the PUC norms particularly for the pre-Bharat Stage IV vehicles. Comparatively, the tests prescribed for petrol vehicles are more evolved and complex (petrol vehicles are tested for carbon monoxide, hydrocarbon and lamda). But in diesel vehicles the one and only test is smoke density test. These tests were originally designed for old diesel technologies that had high visible smoke emissions. But with advancement in engine technologies smoke has disappeared but diesel vehicles have high invisible emissions of tiny particles that are extremely harmful. Tighten the emissions norms for pre-Bharat Stage IV vehicles – both petrol and diesel. Additionally, for diesel vehicles the test procedures will have to be upgraded.</p>	<p>Comments-We are in agreement with the group report</p>

<p>Smoke density test for diesel vehicles ineffectual – need tightening and upgradation of test procedures to address particulate pollution: Review of the scientific evidences from global experience shows that smoke density is not a good proxy for particulate emissions from diesel vehicles. Less smoke does not means less particulate emissions that are very hazardous. With engine upgrades engine smoke disappears and high particulate emissions remain invisible. Currently, direct testing of particulate emissions from on-road vehicles is difficult and is emerging. But as is happening globally, smoke density norms are being tightened and the tests are being upgraded to be conducted on rollers to put load while testing the smoke. This makes the test more effective. This will have to be reviewed immediately and phased-in first for the commercial vehicles</p>	<p>Comments-We are in agreement with the group report.</p>
<p>Legal framework for monitoring PUC centres weak: The rapid survey has shown illmaintained equipment, lack of documentation on calibration of equipment, poorly done tests, lack of standardized software in testing equipment in the NCR, and wide malpractice and fake certificates have seriously compromised the effectiveness of the programme. The investigation has brought out some of these malpractices through decoy operations. Physical inspection has revealed how emissions testing probes are not even inserted in the exhaust pipe, or how it remains unconnected with the computers at the time of testing etc to generate false passes. For quality control, the PUC centres are required to display type approval certificate for equipment, operator raining certificate, calibration report etc. Some of the centres inspected were found defaulting on these grounds. Depending on the irregularities departments are either expected to issue warning, or show cause notice or cancel license. But effective implementation of these requirements is not uniformly stringent across the NCR. The entire NCR requires a standardized protocol for monitoring and management of the PUC centres.</p>	<p>Comments-For effective implementation of the legal requirement in entire N.C.R. region of the U.P. Districts be prepared a standardized protocol for monitoring of the P.U.C Centers</p>
<p>Concerns over skills of operators: There is lack of skilled and trained personnel in PUC centres. The two-three days training imparted by equipment manufacturers is found to be very inadequate. Staff turn-over is high. Training is also imparted to those who are not regular operators. There is no evidence of PUC centres training back up personnel.</p>	<p>Comments-We are in agreement and it should be insured.</p>
<p>Decentralised testing centres vs centralised testing: It is quite clear that the large numbers of decentralized PUC centres across NCR without a robust framework for quality control need a re-think. To make this system work city governments require exceptional administrative capacity for enforcement. This is seriously compromising the effectiveness of the programme. Merely allowing further expansion of and investment in the current decentralized poorly monitored PUC centres will only create entrenched business interest in a weak programme. Therefore, strategic phase-in plan for big centralised emissions testing centres that are fully automatic and eliminate manual interference, and are capable of conducting high volume of emissions tests should be implemented for the commercial vehicles first. This will also help to upgrade the emission testing system and procedures that is not possible in small centres.</p>	<p>Comments-We are also in agreement of the suggestion given by the group.</p>
<p>Integrate on-road monitoring system in-built in vehicles with vehicle inspection programme: EPCA would like to emphasise that all new BSIV compliant vehicles since 2010 have come equipped with on-board diagnostic system (OBD) that were further upgraded in 2013. The OBD system stores important information about any detected malfunction in vehicles so that a repair technician can accurately find and fix the problem. This identifies emission-related components covered under warranty. Fault codes and other scan tool data give information about area of malfunction or a specific component. This helps with early Detection of Malfunctions. Globally this tool is being integrated with vehicle inspection and maintenance programme. In addition to the physical check the information from vehicle can be scanned and acted upon. Ministry of Road Transport and Highways and the concerned state transport departments must implement strategies needed to integrate OBD with the vehicle inspection programme. There is an urgent need to develop new test protocol by involving OBD check especially for new generation vehicles. Globally</p>	<p>Comments-We are also in agreement of the suggestion given by the group.</p>

<p>this tool is being integrated with vehicle inspection and maintenance programme. In addition to the physical check the information from vehicle can be scanned and acted upon. Ministry of Road Transport and Highways and the concerned state transport departments must implement strategies needed to integrate OBD with the vehicle inspection programme. There is an urgent need to develop new test protocol by involving OBD check especially for new generation vehicles.</p>	
<p>Upgrade in-use emissions monitoring programme for the new generation vehicles to come with Euro VI emissions standards in 2020: Any assessment and overhaul of vehicle inspection programme at this juncture will remain incomplete and inconsequential if strategies to address the on road emissions from new generation vehicles with advanced emissions control systems like the particulate trap etc are not prepared and implemented now. Current basic PUC emissions tests will not be able to address these technologies. Interestingly, while conducting this rapid survey of PUC programme the PUC operators pointed out that hybrid models cannot be inspected under the current PUC regime but they turn up for tests. This is only to illustrate the point that new genre of technologies will require different regime. It is more important to note that the Euro VI vehicles to come in three years time will have different in-use monitoring requirement. The Euro VI notification of the Ministry of Transport and Highways has provide for real-world driving emissions test procedures and standards – real emissions to be monitored while vehicles are moving on the road. Thus, the future roadmap for improving emissions inspection programme will have to chart the roadmap for new age vehicles as well.</p>	<p>Comments-We are also in agreement of the suggestion given by the group.</p>
<p>1.3 Summary recommendations of EPCA Without a robust system of emissions monitoring and compliance, the investments in emission control systems in vehicles to meet tighter emissions standards at the time of manufacturing vehicles can go waste and negate air pollution control efforts in our cities. Therefore, the following recommendations are made: For improved compliance with the PUC programme:</p> <ul style="list-style-type: none"> • Ensure 100 per cent compliance by linking annual vehicle insurance with PUC certificates. Annual vehicle insurance cannot be obtained without all the requisite PUC certificates. Periodicity of PUC certificate can be standardised across the NCR. • Introduce automatic online network for transmission of PUC data to the central server to minimize manual interference and allow proper analysis of data for remote auditing of PUC centres. Adopt uniform and standardized data recording and reporting format and uniform software across Delhi NCR. Mandate periodic analysis of data to refine enforcement and for monitoring and submission of compliance report every 6 months. • Mandate pre-payment of PUC fees before the tests are conducted • Strengthen inspection of the PUC centres for quality control but phase in big centralized emissions testing centres capable of conducting automatic and upgraded tests for commercial vehicles on a priority basis. Delhi already has Burari vehicle inspection and fitness centre in Delhi for commercial vehicles. This may be made operational for high level of automatic emissions testing. Ministry of Road Transport and Highways is also setting up centralised inspection centres in NCR. These should be aligned to firm up the roadmap. 	<p>Comments-This is necessary and committee on road safety has directed to act upon at such and as like Delhi ,in Lucknow Vehicles inspection and Fitness centre is under constructions and it will be operational in coming 3 months.</p> <p>Comments- The State of UP is in the process of improving the PUC programme as recommended by the EPCA.</p>
<p>For improving the effectiveness of the PUC tests and inspection</p> <ul style="list-style-type: none"> • Tighten the PUC emissions norms for pre-Bharat Stage IV vehicles: Analysis of large data set on actual emissions concentration tested in large number of PUC centres in Delhi and UP has also brought out that the actual observed emissions values of pre-Bharat Stage IV vehicles are significantly lower than their prescribed norms. In most cases 80 per cent lower than the limits. These norms cannot identify at least 15 to 20 per cent grossly polluting vehicles in the on-road fleet. Nearly all vehicles pass the tests. The overall failure rate in Delhi is 4.69 per cent. For the diesel vehicles tested, the failure rate stands at 1.61 per cent, compared to 5.18 per cent for petrol vehicles and 4.65 per cent for all other fuel categories requires urgent attention and action. In UP NCR cities, the overall failure rate is abysmally low, at 0.49 per cent – 0.39 per cent 	<p>Comments- WE agreed to Tighten the PUC emissions norms for pre-Bharat Stage IV vehicles is urgent need of the hour for such vehicles. As per report in UP NCR cities the overall failure rate is very poor ranging between 0.49%-0.39% in two wheelers and 0.59% for four wheelers definitely. This is very serious and requires urgent attention. Concerned officers already been instructed to periodically inspect the</p>

<p>in 2 wheelers and 0.59 per cent in four wheelers. Ministry of Road Transport and Highways need to tighten the PUC standards for the pre-Bharat Stage IV emissions standards. This requires urgent attention and action. Ministry of Road Transport and Highways need to tighten the PUC standards for the pre-Bharat Stage IV emissions standards.</p>	<p>PUC centres but as per report it appears that the inspecting officers are not serious. Repeated instructions are sent for this purpose. Again instructions are being sent for tighten on the issue.</p>
<p>Overhaul emissions tests and tighten norms for diesel vehicles: The review of available data shows that the smoke density test – the only test that is carried out in diesel vehicles is very lax for the pre-Bharat Stage IV diesel vehicles. More than 80 per cent of vehicles tested show smoke density levels that are below the norm prescribed for the Bharat Stage IV vehicles. Therefore, the current norms for Bharat Stage IV norms should be made uniform for the pre-Bharat Stage IV vehicles as well and further tightened to 40 HSU. Moreover, as explained earlier globally smoke tests are being upgraded with more advanced test procedures to make these tests more rigorous and effective. Ministry of Road Transport and Highways may review those advanced testing procedures and provide a roadmap for their introduction in the large centralized testing centres for commercial vehicles.</p> <p>Overhaul emissions tests and tighten norms for diesel vehicles: The review of available data shows that the smoke density test – the only test that is carried out in diesel vehicles is very lax for the pre-Bharat Stage IV diesel vehicles. More than 80 per cent of vehicles tested show smoke density levels that are below the norm prescribed for the Bharat Stage IV vehicles. Therefore, the current norms for Bharat Stage IV norms should be made uniform for the pre-Bharat Stage IV vehicles as well and further tightened to 40 HSU. Moreover, as explained earlier globally smoke tests are being upgraded with more advanced test procedures to make these tests more rigorous and effective. Ministry of Road Transport and Highways may review those advanced testing procedures and provide a roadmap for their introduction in the large centralized testing centres for commercial vehicles.</p>	<p>Agreed</p>
<p>Integrate OBD with inspection and maintenance programme: Ministry of Road Transport and Highways need to develop the protocol for implementation of OBD for vehicle inspection. This will complement the physical testing.</p>	<p>Comments - It should be done and State will follow.</p>
<p>Preparedness for advanced in-use emissions monitoring programme Provide roadmap for advanced emissions monitoring of new generation vehicles to come with Euro VI emissions standards in 2020: Any roadmap for improving vehicle inspection programme will have to keep in view the dramatic transition in vehicle engine technology that the market will witness in three years from now when Euro VI emissions standards will be enforced. The notification of the Ministry of Road Transport and Highways on Euro VI standards requires introduction of Real Driving Emissions Test Procedures and Standards based on portable emissions monitoring system to monitor emissions as vehicles move on the road. This is needed to ensure that all the advanced emissions control devices that to be fitted in the new vehicles will continue to perform effectively in real world. This is needed in view of the large deterioration in emissions noted in new vehicles even after meeting tighter emissions standards in Europe and the US and to prevent use of defeat devices</p>	<p>Comments-State is in process of developing online monitoring system of PUC Centers and real time data transfer.</p>
<p>Table 1 : Salient features of physical inspection of PUC centres in Delhi and NCR given in the table at page no. 10 to 14.</p>	<p>This table pertains to cities of NCR-Delhi, Haryana- Gudgaon-Faridabad-Rohtak-Jhajjar, U.P.-Ghaziabad-Gautambuddh Nager- Bulandsaher-Bagpat-Samli-MujafferNager-Meerut and Hapur. The table shows that automatic and availability of central server and network is only available in certain centers in Delhi, but in other state including U.P. there is no automatic and availability of centers server and network and as such all the PUC Centers recognized by the respective authorities are Manual. Comments-State of UP is in the</p>

	<p>process of establishing automatic and availability of central server and network.</p>
<p>2. Detailed findings of the assessment and physical audit of PUC centres 2.1 Problem with PUC data reporting (manual as well as automatic) While vast multitude of PUC tests are being carried out in thousands of PUC centres across the NCR data keeping, collation and reporting are very poor. This does not allow proper analysis and auditing to inform enforcement and monitoring. Delhi is the only city in the NCR that has invested hugely to network all the PUC centers for automatic recording of all emissions tests results in the central server. This has been done to minimize manipulation of results by the PUC operator as the test results are automatically transferred to the central server called Parivahan Mitra as soon as the test is done. Such a facility also allows periodic analysis to see if anomalous data is emerging indicating malpractice. This also helps to audit PUC centres remotely and give an idea about the level of compliance. But the PUC data submitted by the Delhi transport department indicates that proper data protocol has not been maintained and the data is not easily accessible with adequate detail to allow proper analysis. It mostly gives the gross data in terms of pass and fail. In fact Delhi Transport Department had to be persuaded thrice to submit data according to the format of EPCA. Properly disaggregated data related to vintage of vehicles in terms of adherence to BSIV, BSIII or BS II and older emission standards; age or manufacturing date of vehicles, or vehicle category wise data was not available. In spite of there being a huge investment to collect these fields of data at the level of the PUC centre, this data is not recorded properly in the centralized server due to mismanagement of the software. Most of the data came clubbed for both cars and two-wheelers in Delhi. Diesel vehicle data was very inadequate and garbled. In the excel sheet "HSU" (Hartridge Smoke Unit) and "K mean" values of diesel vehicles were garbled and could not be analysed. Whatever data could be retrieved manually for diesel vehicles could be analysed. It is unfortunate that despite such huge investment in automatic online system for PUC data reporting its usability was so poor and Figure 2). Data reporting will have to be improved immediately so that this investment does not become wasteful.</p>	<p><u>Comments-</u> This findings of the assessment and physical audit of PUC Centers are related to Delhi. Figure: 1 Snapshot of Parivahan Mitra-Centralized PUC Data of the Transport Department of Delhi and Figure: 2 Snapshot of excel sheet PUC data sheet provided by Transport department of Delhi we are not concerned. So for as draft reports as page no. 17 reveals about Uttar Pradesh that data regarding PUC is purely manual but the department officials have started efforts to create a unique PUC Number for every vehicles tested, details make of the model vehicle, vehicle category, vehicle model year (reg. date), test date, test time, tested imitation levels for CO, SC, Co2, O2, RPM, LAMBDA and smoke density. Data is being recorded on physical registers sheets or paper and authorities started to maintain the necessary record in physical as well as digitized format after the EPCA meeting that was held on this issue on January. Draft report is also indicated even though a much smaller data set this could be analyzed better. The draft report also says that analysis of data from the PUC centers of Uttar Pradesh shows some anomalies indicating malpractice on ground, such as series of vehicles with emit ion levels exceeding the norms were categorized as "Puc pass" draft report also indicates this is the pattern in several districts of U.P. situated in NCR.</p> <p><u>Comments-</u>As per suggestion given in the draft report, Although instructions are already being sent to the field authorities of NCR districts of U.P. to insure proper data keeping and analyzing so as to stop mile practices and also remote auditing and compliment physical inspection. But we are again repeating instructions to follow strictly.</p>
<p>EPCA therefore proposes uniform common format for PUC data recording and reporting for both manual and automatic data recording system. Phase in automatic data recording in the central server 2.2 Level of compliance – how many vehicles turn up for tests</p>	<p>Agreed</p>

<p>It has not been possible to establish with reliability what proportion of vehicles in the city actually turn up for tests. The state governments do not maintain that record. This is the weakest link in the enforcement mechanism. Periodicity of tests also varies across the NCR. While Delhi requires a PUC test every quarter for pre-BS-IV vehicles and once a year for BS-IV vehicles, the periodicity in Uttar Pradesh is every 6 months. But it has not been possible to assess if all the vehicles actually turn up for the tests.</p> <p>Even though Delhi has an automatic central server linked to all PUC stations it has not been possible to assess detailed database. The IT cell of department of transport does not analyse the PUC data to know if all registered vehicles are complying with required tests and if all vehicles are turning up for tests. The physical inspection of centres have shown that PUC testing operator do feed the vehicle registration number plate and this automatically retrieves the owner name, address etc from the transport department's central server. Therefore, technically it is possible to know how many vehicles out of total registered vehicles are turning up for the tests but this data is not analysed or formatted to make this analysis available to use it for enforcement.</p> <p>However, effort made by EPCA to analyse the available data shows that the level of compliance in Delhi is even less than a quarter -- only 23 per cent of total vehicles turn up for tests. Such an analysis has not been possible for Haryana and Uttar Pradesh as the data is purely manual and complete data for all centres with adequate detail are not available.</p>	<p><u>Comment</u>-We agreed the proposal of EPCA and it will be implemented in phased manner</p> <p>As per suggestion provided given in draft report the transport department will comply</p>
<p>EPCA recommends making annual vehicle insurance policy mandatory and conditional with PUC certification.</p>	<p>Agreed</p>
<p>BOX: Compliance level in Delhi</p> <p>In Delhi, the Department of Transport, Government of NCT of Delhi provided EPCA with the PUC records for the months of November 2016, December 2016 and January 2017. For this three month period, the total number of PUC tests conducted was 1.37 million. The total vehicular fleet in Delhi stands at 6.47 million vehicles as on August 1 2016 (As per the Department of Transport, Government of NCT of Delhi). Of these, 2 and 3 wheelers account for 4.18 million vehicles, or 64.6 per cent, and 4 wheelers (cars and taxis) account for 2.12 million vehicles, or 32.8 per cent. Even if these numbers are reduce to adjust for scrappage and retirement of vehicles the numbers are still very substantial and much higher than 1.37 million vehicles.</p> <p>In Delhi, all vehicles except those adhering to BS IV emission standards are expected to get PUC certified every three months. BS IV vehicles are expected to get PUC certified annually. This means every quarter entire vehicular pre-BSIV fleet of Delhi has to come for PUC tests. To that is added at least a quarter of the BSIV vehicles that take annual certificates.</p> <p>As per registration data provided by the Department of Transport, Govt. of Delhi, 35 per cent of the four wheelers registered in Delhi, or little less than 800000 vehicles are meeting BS IV emission standards. The remaining 1.38 million vehicles are meeting BS III emission standards or lower. The entire 2 & 3 wheeler fleet numbering 4.18 million is adherent to BS III emission standards or lower.</p> <p>Thus, the number of PUC tests to be conducted per quarter should at least be 1 5.91 million. But the PUC data accessed for Delhi, for the period of November 2016 to January 2017 (3 months) shows tests of only 1.37 million vehicles.</p> <p>This works out to be a compliance rate of 23.2 per cent. A large number of vehicles in Delhi, around 3 out of every four vehicles, remain outside the PUC testing network.</p>	<p>This is related to Delhi. No comment is required from Transport department Uttar Pradesh.</p>
<p>2.3. Analysis of emissions data show low failure rate and lax emissions limits</p> <p>It may be noted that under the PUC programme tests are carried out to check the pollutant concentration in the exhaust of the vehicles in idle condition to see if poor maintenance or any malfunction has caused the vehicle to emit more than it is designed to emit. There are two set of PUC norms for both petrol and diesel four wheelers – for vehicles that comply with Bharat Stage (BS) IV emissions standards and for pre-BS IV vehicles. For two and three wheelers, the norms are set according to year of manufacture and nature of engine (2/4 stroke). Moreover, in petrol vehicles – cars and two-wheelers, as well as CNG vehicles, concentration of</p>	<p><u>Comment</u>-In this Para draft report shows the fellow rates in different states which reveals very poor and specially in U P towns very poor ranging from 0.49%-0.39% in 2 wheelers and 0.59 percent in 4 wheelers we agreed with revenue of the study group indicated in the draft report after a huge investments in setting of large</p>

<p>hydrocarbon and carbon monoxide are tested. In addition lambda (air to fuel ratio) is measured to ensure that the operative conditions that are needed for optimum functioning of the catalytic converters are functioning well as these are needed to clean up the petrol exhaust.</p> <p>In diesel vehicles only smoke density tests are conducted. While carrying out these tests engine speed and oil temperature are also monitored to ensure that the tests are being conducted on a sufficiently warmed up engines and the optimum acceleration speed has been achieved that is needed to do the smoke density test.</p> <p>Failure rate: The overall analysis of PUC data shows dismally poor failure rate among vehicles. Nearly all vehicles pass the tests. In Delhi the overall failure rate is 4.69 per cent. For the diesel vehicles tested, the failure rate stands at 1.61 %, compared to 5.18 per cent for petrol vehicles and 4.65 per cent for all other fuel categories (CNG/LPG/xEV's/Others).). In UP towns, the overall failure rate is abysmally low, at 0.49 per cent – 0.39 per cent in 2 wheelers and 0.59 per cent in 4 wheelers.</p> <p>Thus, huge investments made in setting up such large number of decentralized testing centers cannot even identify 15 to 20 per cent of the most grossly polluting vehicles on the road. This is particularly a matter of concern in the case of diesel vehicles. This programme can barely make any difference to the air quality. (see Graph 1: Failure Rate by Fuel Type in Delhi and Graph 2: Failure Rate in four wheelers in Uttar Pradesh (in % of vehicles tested).</p>	<p>number of de centralized testing centers are not able to identify 15 to 20 percent of the most grossly polluting vehicles on the road report also says very poor pre 2000 registered 4 wheelers tested report fellows rate is 0 the report also indicate P U C operators in UP do not record the fellows data are abort the test if the suspect the vehicles will fail the test because they do not collect PUC testing fees before conducting the test. If the vehicle fails the test the vehicle owner refuses to pay for test. hence the operators have no incentive comments instructions for depositing test fee for all vehicle owner are being sent to the field authorities and PUC operators for compliments all vehicles to deposit the test fees for all vehicles either passed or fail</p>
<p>EPCA recommends making advance payment for test mandatory and software should be modified accordingly.</p>	<p>AGREED</p>
<p>2.4 Weak PUC norms Review of the actual tested emission values have also indicated how weak the PUC norms are. Doing this analysis is however challenging as the data provided to EPCA by the Department of Transport, Government of Delhi is aggregated, and emission values are not separate for vehicle categories and their vintage/emission norms. Even though these details are recorded at the PUC centre, the data provided from the centralized PUC server do not include these details. However, analysis of the limited information gives deep insight into the problem.</p>	<p>This pertains NCT of Delhi</p>
<p>2.4.1. Norms for diesel vehicles EPCA has analysed the available data to find that nearly all diesel vehicles of all vintage are below 50 HSU which is the norm for BS-IV vehicles. Rarely any vehicle exceeds the limit value of 65 HSU that is meant for pre-BSIV vehicles. The current smoke density norms are too tax to fail any vehicle as the modern engines cannot have such high level of smoke unless very badly out of tune. HSU limit will have to be tightened for all diesel vehicles. Overall, more than three-fifths of the vehicles have smoke density values less than 60 per cent of the norms meant for BS-IV vehicles. The norms are so lax that a large number of vehicles can easily meet the standards with a margin of 80 per cent or more. (See Graph 3: Distribution of tested smoke density values for diesel vehicles).</p>	<p>This pertains NCT of Delhi</p>
<p>In NCR towns of Uttar Pradesh, about 48 percent of the BSIV diesel 4 wheelers have smoke density values less than 60 per cent of the norms meant for BS-IV vehicles. For Pre-BS IV vehicles, 60 percent of the 4 wheelers have smoke density values less than 60 per cent of the relaxed norms (See Graph 4: Distribution of tested smoke density values for Pre-BS IV diesel vehicles in NCR towns of Uttar Pradesh and Graph 5: Distribution of tested smoke density values for BS IV diesel vehicles in NCR towns of Uttar Pradesh).</p>	<p>Comments-the report reveals the BSIV diesel vehicles and pre BSIV vehicles report for UP, no comment is required</p>
<p>2.4.2. Norms for Petrol vehicles Data from 12 lakh petrol vehicles in Delhi shared with EPCA has come clubbed together for cars and two-wheelers. It has not been possible to disaggregate them. Nonetheless, frequency distribution of all petrol vehicles have still been checked vis a vis the norms meant for both cars and two-wheeler just to understand where most of the values fall.</p> <p>A large number of pre-BSIV vehicles are easily meeting the carbon monoxide standards meant for BSIV vehicles with a margin of 80 per cent or more (see Graph 6: Distribution of tested CO emissions for petrol vehicles). But it is also very</p>	<p>This pertains NCT of Delhi , hence no comment is required</p>

<p>erroneous to see that close to 20 per cent of 12 lakh vehicles have zero carbon monoxide values which is not possible.</p>	
<p>Similarly, in case of hydrocarbon emissions when all vehicles are included almost 88 per cent of two and four wheelers meet the most stringent standard. Disaggregated data for petrol two-wheelers are available from the NCR towns of UP. Similar trend has been noted in the two-wheeler segment. Data of about 7000 two-wheelers from UP towns have been analysed. (see Graph 7: Distribution of tested hydrocarbon emissions for 2-wheelers manufactured after 2000 – NCR towns of Uttar Pradesh and Graph 8: Distribution of tested carbon monoxide emissions for 2-wheelers manufactured before 2000 in NCR towns of Uttar Pradesh). This shows that the actual emissions concentration in nearly all these vehicles is significantly lower than the standards.</p>	<p>This data pertains to the actual emissions concentration which is lower than the standards. Thus the picture in UP is better. Hence no comment is required.</p>
<p>2.5. PUC norms and testing procedures for diesel vehicles need to be upgraded:</p> <p>While PUC tests for petrol vehicles are more evolved and has higher degree of complexity, the one and only smoke density test for diesel vehicle based on simple test procedures and lax norms is very inadequate and ineffective. It may be noted that smoke test was introduced for older generation vehicles to reduce the visibility problems of Diesel smoke. But given the fact that particulate emissions are a serious concern from diesel vehicles, there is no real correlation between smoke density and particle emissions which is the main concern for diesel vehicles.</p> <p>The scientific literature review carried out by EPCA shows that smoke is not a good surrogate for tiny particles. There can be a risk of misclassifying polluters – low smoke emissions can also be high emitter of particulate matter. Even in Europe virtually no vehicle fails the smoke test. Other governments including China, Hong Kong, Singapore, the US, etc are now conducting these tests on chassis dynamometer to simulate speed. This makes the emissions test more rigorous. In fact other countries have tight smoke density limit – Singapore and Pakistan the norm is 40 HSU; in Indonesia, Thailand, Hong Kong, Malaysia it is 50-HSU for all genre of vehicles. China is further developing a nationwide I/M system for evaluating nitrogen oxide emissions from in-use heavy duty diesel vehicles.</p> <p>Smoke tests are irrelevant in advanced diesel engines. Need urgent steps to upgrade the current in-use emissions testing, prepare for real driving emissions testing with portable emissions monitoring systems for Euro VI vehicles and make vehicle Draft PUC Report (Unedited) 2017</p> <p>27</p> <p>manufacturers liable and accountable for emissions performance of the vehicles during their useful life on the road.</p> <p>Thus, Singapore conducts Chassis dynamometer Smoke Test. Australia also carries out dynamometer based DT80 and DT60 tests designed for typical 'realworld' vehicle emissions and requires the use of a dynamometer with inertia simulation. 'Lug-down' loaded test is conducted in United States and Hong Kong. In this test chassis dynamometer is at a fixed speed – vehicle running at full throttle; dynamometer load is gradually increased to reduce the engine speed until the engine is labouring or 'lugging'. Europe is looking at load test to measure NOX.</p> <p>Petrol vehicles: Under PUC the tests for petrol vehicles are more evolved and these are tested for carbon monoxide and hydrocarbons along with lambda (that indicates the optimum condition needed for proper functioning of catalytic converters). But these tests will have to be conducted with credibility. This is serious issue at a time when Delhi that already has more than 900 PUC centres is trying set up more. This investment can go waste without an effective system in place.</p> <p>In China, petrol vehicles follow IM 240 dynamometer test for light-duty vehicles. A vehicle is mounted on a dynamometer – allowing simulation of the vehicle inertia - driven over a transient cycle; Duration of the test is 240 seconds; It shows good correlation with the type approval duty cycles for CO2 and NOx but poor correlation</p>	<p>As per draft report PUC norms and testing procedures for diesel vehicle regarding up gradations is necessary. In view of advanced diesel engines all the type smoke tests have become irrelevant hence up gradations of in-use imitation testing is required thus we agreed with the draft report.</p> <p>In view of petrol vehicles PUC test for carbon mono oxide and hydro carbon along with lambda, these tests will have to be conducted with credibility</p>

<p>with CO and HC; ASM dynamometer test: on the dynamometer at a constant speed Evaluation study of ASM tests have concluded that they can identify more than 80 per cent of excess HC and CO emitters, with few errors of commission</p>	<p>hence we agreed about the views of the team as mentioned in the draft report.</p>
<p>EPCA recommends that the Ministry of Road Transport and Highways should review the lax norms and test procedures especially for diesel vehicles and take necessary action to tighten the norm and upgrade test procedures for effective results.</p>	<p>Agreed and point wise comment is given below at appropriate place.</p>
<p>2.6. State of emissions testing equipment in PUC centres</p> <p>EPCA investigation has taken note of the 2003 guidelines of the Ministry of Road transport and Highways, that states that every PUC equipment manufacturer/supplier must comply with the Code of Practice and submit an affidavit for the same along with the instrument model submitted for type approval to the respective Test Agency. EPCA kept these guidelines in view while assessing the PUC centres. These guidelines include:</p> <ul style="list-style-type: none"> • PUC equipment manufacturer/supplier shall supply copy of type approval certificate with date of validity along with the PUC equipment • The validity of the type approval certificate of the PUC equipment shall be 5 years after the expiry of Which the PUC equipment manufacturer/supplier shall get it revalidated from the test agency. • PUC equipment manufacturer/supplier shall enter into AMC for a period of 5 year with the authorized PUC test agency based on agreed charges. The AMC shall be comprehensive (including spare parts) but does not include maintenance of PC/PC peripherals of the computerized PUC equipments. • This needed to ensure timely maintenance of the equipments for testing for authentic results. The calibration and method however varies across products of different equipment manufacturer. The market is inundated with machines of different kind, with only the most basic methods being standardized. The only check in this system being that all such machines acquired by the PUC Licensee have to be type approved by the ARAI (Automotive Research Association of India). • Calibration procedure for testing of Gas Analysers, to be followed by the PUC Agency: • Check the span and zero calibration using sample gas of suitable value for CO as well as HC. • Check the electrical calibration • Check that the sampling <p>Diesel Testing protocol to be followed by the PUC Agency:</p> <ul style="list-style-type: none"> • The meter shall have the standard accessories as specified by the manufacturers. It shall be checked that the internal pipes etc are not deteriorated or damaged t ensure that there is no leakage. • The functionality of oil temperature and RPM sensor. • The heating system for the optical chamber is functioning. • The purge air system is working correct. • The instrument casing is proper and has proper electrical earthing. • Free acceleration test is carried out using a vehicle and the print out details are checked. <p>Delhi: As Delhi has remained under scrutiny for a long time in most of the centres inspected the emission testing machines were functioning as per procedure. However, in some stations, it has been found that leak test caps are not available and probe needs cleaning. Some operators complained that equipment service providers need to be prompt to provide the services. Several of them could not show periodic calibration proof. All centres were found to be operating with proper instrumentation and accessories. Probe cleaning should be improved. Filters are found to be as per procedure. RPM sensors are found to be proper. Oil temperature measurement is not required as per the changed procedure for diesel vehicle test.</p> <p>Ghaziabad: Most of the centres inspected -- 7 out of 10, did not have a proper probe and filter was missing. In M/s Sharma Filling Station (centre code-724); there was no probe and only rubber tube was available. Diesel probe was broken and</p>	<p>Draft report as para 2.6 rewrites the position and status of imitations testing equipments in PUC Center in different in Delhi, U.P.- Ghaziabad-Gautam Buddhnagar-Bulandshahar, Harayana_Gurgaon-Rohtak. In UP Ghaziabad, Gautam Buddh Nager, BulandSahar many of the centre did not have a proper probe and filter for proper testing. Similarly in BulandSaher fake software was found which is manipulated by the operator so as for pass/fail of the vehicles automatically. We have taken it very seriously and action against such centers will be taken as per providence of the authorization of the center.</p>

leaking, yet the operation continued normally in Vardhman Petroleum (centre code- 902). Three centres had proper copper probe with a normal length of 30 cm. No extension pipes were available in any of the centres.

Gautam Buddha Nagar: Out of the five centres audited, two centres did not have copper probe whereas others have proper probe of sufficient length. The filters were cleaned in all the centres frequently.

Bulandshahr: In one of the PUCC named Shri Khatu Shyam Pandit Auto Service (centre code- 1075), the diesel probes was absent though machine was there. This was the same case in one of the other centre i.e., M/s Nida Welfare Society (centre code- P-614/D-849). Copper probe was missing in six PUCCs

Gurgaon: Here the team found largely the use of Ozone machine and Indel machine for emissions testing. Six PUC centres do not have diesel testing machines, the rest have functioning petrol/diesel machines but it used the petrol probe to check the diesel vehicle that the EPCA team had taken.

The rod used in the probe for the petrol machine was not copper. The length was insufficient (less than 30 cms) in 7 centres. Lens in the smoke opacity meter were absent in 5 of the PUC centres. Two centres did not have probes for the smoke opacity or the gas analyzer test. Not a single centres had RPM sensor or jump cables to take RPM readings. None of the inspected centres had air conditioning for the testing machines. A.K PUC Center had rusted diesel testing machines. The smoke opacity machine had not been calibrated. The operator used a diesel probe to check the opacity, but pointed to the petrol testing machine when asked how he gave the inspection team, a pass certificate with a broken machine.

Faridabad: Most centres use AVL and Ozone hardware and software. All 5 centres inspected had upgraded petrol and diesel machines. This is primarily due to the active initiatives of the Faridabad RTO implemented last year, wherein all centres found without upgraded PUC machines were suspended or shut down. All 5 centers had separate probes for the petrol and diesel machines. Only one centres (Indrasuddha Associates) had a faulty diesel testing machine. The operator despite that checked our vehicle with a petrol probe and issued us a pass certificate.

Rohtak: Most centres use AVL, Ozone or Sigma machines. AVL machines were found to be periodically calibrated. Out of the 10 centres inspected, 5 centres did not have functioning machines. Out of the remaining 5 only three PUCCs had proper calibrated machines with certificates (Sanjay PUCC, Rathi PUCC and S.K. PUCC). Only 4 stations had Copper rod probe. S.K PUCC, which had a proper calibrated machine, did not have a diesel probe.

The length of the probe was insufficient in 6 PUCCs. Broken pipes, with haphazard repairs were a common sight. None of the centres in Rohtak had air conditioning for the machines. None of the of the centers had a cleaning mechanism for lens of the smoking

Overall, it was found that the PUC centres have annual maintenance contract with the equipment manufacturers. It is evident that the OEMs reach out to the PUC agencies to calibrate and keep machines updated. This has proved to be effective in keeping the machines in satisfactory conditions. The AMC at the moment only covers machines and computer peripherals (testing software). The AMC should extend to probes and pipes. Broken pipes and damaged/overused/ non-copper probes/ insufficient length were a common observation through the three regions of Rohtak, Gurgaon and Haryana. This is crucial to the testing process as a broken pipe could mean erroneous readings and a faulty test result.

Bulandshahr: In all the PUC centres tested in Bulandshahr, fake software was found. This software allowed manipulation by the operator, allowing them to generate randomized RPM's, CO, HC and HSU readings. These software alterations were fairly advanced, fixing the parameters for pass/fail of vehicles automatically, and there was a prepared menu of cars and makes with different pre-set values for RPM and HSU, independent of year of manufacturing. In an extreme case, there was no software at all present at a centre, but simply an Adobe Photoshop programme to manipulate and print the PUCC.

The software "Polcer" was a very common fake PUC programme used.

<p>There were 3 centres found operating without any emission analyzing machines at all. These were using altered software and were functioning openly, issuing false certificates without any attempt to hide the fact that there was no machine.</p> <p>Cities of Haryana and Uttar Pradesh: The software in most of the PUC centers was tampered with. Pre-set readings which were randomized for each test by the software itself was an issue common to all the districts of Haryana and Uttar Pradesh audited. The software is said to be issued by the OEM, but we found different versions of the same software at different centers. Certain softwares allow for the data of old tests to be stored and reused for new tests. Such a malpractice raises question on the integrity of the software.</p> <p>A common observation in the region of Haryana, especially those inspected by the EPCA Audit team, was the proliferation of fake certification software. All regions inspected had an issue of fake or unauthorized software being used to issue a PUC pass certificate.</p> <p>The issue stems from the fact that the software is often not standardized or connected to a central server, as is in Delhi or any other mechanism to counter check it against.</p> <p>Standardization of Testing Software: Softwares are supplied to the PUC agency by the OEMs of the machines that they have acquired. However there are no regulations or method for the functioning of this software to sync them to for cross-checking or authentication of data, as is case of Delhi. The team came across different kinds of generic certificate software (certificate management system, Ozone testing programme, Ozone certificate programme, testing software and certificate management programme are few of the softwares we encountered)</p>	
<p>2.6. Calibration of instrument and Calibration report</p> <p>Regular calibration of instrument and equipment is critical to get authentic test results. The EPCA teams checked for evidences of calibration.</p> <p>Delhi: Most centres inspected in Delhi were found to have valid calibration certificates. But some did not. For example, in Arora Service Station (code P-495, D-115) calibration information was not available. In a few centers, the displaying of the certificates needs to be improved. The test operators informed that instrument providers do the on-site calibration.</p> <p>Ghaziabad: Out of the 10 centers audited, eight of them did not have calibration certificate. Only two centers namely, Mohan Shiva (centre code- 445) and Harit Prayavaran Samiti (centre code- 582) had their calibration certificate with them.</p> <p>Gautam Buddh Nagar: Out of the five centres inspected, four of them have their calibration certificates, which mentioned the next due, date whereas only one centre Nature Paryavaran Samiti (centre code- 832) did not have the calibration certificate.</p> <p>Bulandshahr: None of the centres has the calibration certificate with them. Only one centre had a certificate but it shows that the last calibration was done in 2013.</p> <p>Gurgaon: Only two out of the 10 tested PUCCs had a calibrated machines to test diesel vehicles. PUCCs do not have the calibration displayed or present at the checking center. When enquired, most operator state that the owner(Licensee) keeps the certificate. Even in instances where the calibration was done the machines were not connected to the computer.</p> <p>Faridabad: None of the PUC center inspected had displayed their calibration certificate. The calibrations of the machines are done every 4-5 months according to the operator.</p> <p>Rohtak: All 10 PUCCs inspected, have their machines regularly calibrated by the OEMS. This seems more due to the practices of the OEMS to cash in on the AMC scheme to make money of these instruments.</p> <p>Type approval or calibration certificates are not displayed, thus difficult to ascertain if the calibrations are indeed made.</p> <p>By the accounts of the operator the OEMS take the machine to their centers and calibrate it. Thus the operator has no knowledge of the process or the necessity of the process.</p>	<p>Reports reveals many e-regularities which are being done in the software by many centers situated in Ghaziabad, GutamBuddh Nager and Bulandsahar of U.P.</p> <p>Proper directions are being sent to inspect such centers and report for violation and manipulation so as action may be taken against such center as per law.</p>

<p>EPCA recommends the following with regard to equipment and calibration: Software used in different make of testing equipment across NCR is not standardized and this can be easily manipulated to generate fake values. But software in Delhi is uniform and stanardised as it is linked with a central server. Same step be taken in the rest of NCR so that single standardized software is used.</p> <p>Enforce calibration of testing equipment with utmost stringency and link with permit conditions that can be revoked if such violations are noted.</p>	
<p>2.7: Reliability and authenticity of testing and malpractices</p> <p>Delhi: For petrol vehicle testing in most centres inspected the probes used for testing are leak proof with the sufficient length. In one center, low flow error code was observed in the instrument pump work. All the centers inspected had instruments for RPM measurement.</p> <p>For diesel vehicle testing all the centers inspected had provided RPM sensor. Oil temperature sensor was not available as they are required anymore. GO / NO GO Gauge was not provided as they are required anymore.</p> <p>Some anomalies have been observed in Delhi. The team had taken a car for decoy testing to first Anand service station (code P 276) Mahipalpur on Delhi Gurgaon road where the vehicle failed as this BSIV vehicle recorded 61 HSU much higher than the norm of 50 HSU. But the same vehicle when taken immediately to Rajasthan Rajpath Filling Station (Khasra No 4, Delhi-Jaipur Road, NH8 Samajha) it recorded 47 HSU and it passed. There are therefore questions about the repeatability of the tests, the way the test has been conducted.</p> <p>Similarly, in Arora Service Station (Code 495 D- 115) where the team had taken a diesel car for testing, the operator checked oil temperature and RPM but did not check the exhaust for smoke opacity. Initially he said that it has passed and was about the certificate. But on suspecting changed his mind and claimed that the car did not have the requisite RPM. He was also overcharging for the certificate.</p> <p>Ghaziabad: In a centre named Sharma Filling Station (centre code- 724), RPM and respective emission values for a decoy car was selected through a drop down menu, and then the certificate was issued without any testing of the car (neither checking the RPM or connecting the Exhaust to the gas analyzer at all)</p> <p>In the Anil Paryavaran Samiti centre (centre code- 347), a certificate was issued to a diesel car without giving any acceleration (no proper flushing) and the RPM readings in flushing tests were all similar.</p> <p>There is a proliferation of fake software and machines that allow operators to manipulate and pre-feed the values in the system. This is especially seen in Diesel vehicles, where the test is much lengthier.</p> <p>Many operators have no knowledge of the process. They do not have basic procedural knowledge on how the machine functions, what tests/calibration are necessary or even the fact they are not following the procedure. There is a proliferation of fake software and machines that allow operators to manipulate and pre-feed the values in the system. This is especially seen in Diesel vehicles, where the test is much lengthier. In many cases, the person issued a license to operate is not the actual operator. In multiple cases, the EPCA inspection team even saw a blank pre-signed training certificate, which means that anyone can write their name on it.</p> <p>Gautam Buddha Nagar: In a centre with code 832 software for diesel vehicle was fake. He did not care to insert the probe properly into the exhaust pipe. PUC present without the serial number and the PUC centre code. The centre name was unknown and even the operator was unaware of the name of the centre.</p> <p>Out of the five centres audited, fake software for diesel vehicle was found only in one of the centre. In addition, the operator did not care to insert the probe properly</p> <p>Bulandshahr: In a centre Kamlesh Welfare society (center code- 1190), had a fake software that asks in a pop-up box, "Press 'Yes' to Pass and 'No' to Fail.</p>	<p>Draft report again indicated many malpractices which are being done by many centers recognized by the transport commissioner office and situated Ghaziabad, Gautambuddh nager and Buland sahar.</p> <p>Officer of the concern districts for being instructed for inspection of such centers and along other centers of the districts and report for taking action by the licensing authority against operator of the those center</p>

A centre Narendra Paryavaran Sewa Samiti (centre code- 687) issued a fake PUC for the decoy diesel vehicle without any machine present in the centre. It had a fake software which allows operator to choose from list of vehicles having different pre-set values for RPM and HSU which is independent of year of manufacturing of the vehicle.

The Adobe PageMaker and Photoshop was being used to manipulate and print PUC's in a centre named Durga Sewa Sansthan (centre code- 899).

In a centre M/s. Nida Welfare Society (centre code- P-614/D-849) is issuing a PUC but did not have a probe. The operator issued a fake diesel certificate as the tube didn't was not attached to the machine.

A centre of Shri Khatu Shyam (centre code- 1075) also issued a PUC when the machine was unattached to the computer.

Gurgaon: Not a single PUC center checked for engine oil temperature, RPM (at idle or High). Following through basic maintenance steps like conducting purge test, cleaning lens of the smoke opacity meter was not carried through.

Machines, even when they are calibrated were lying unused, as they were not hooked to the computer. A diesel test which requires approx 10 mins was completed in 2-5 minutes.

The operators don't have thorough knowledge of the testing process or even the certification method to follow. The operator of the P.K.PUC issued a pass certificate for the diesel vehicle on a petrol format certificate. Software of the A.K PUC showed a pass result as the operator was entering the details of the audit vehicle.

No RPM, No flush cycles, no check of engine oil temperature. In stations like D.K.PUC, Vishesh PUC and N. Malik PUC, the center issued us a pass certificate without even inserting the probe to conduct the smoke opacity test.

Gurgaon also had mobile PUCs. The Kuldeep PUC, that the team inspected had a license to check CNG, petrol and diesel, but had machine to check only petrol vehicle.

Faridabad: Two station out of the five PUCs inspected were not in compliance with the testing process. However the issue of tampered/ fake software persists.

The operators do not have a thorough knowledge of the testing procedure. When enquired about the air conditioning, most operators were ignorant that the machines have to be kept at a certain temperature to maintain the efficiency of testing.

Rohtak: All 10 inspected PUCs did not measure RPM, or Oil temperature to check if the engine is warmed up or not. In 5 stations the machine was not connected to the computer. Not a single PUC center used the diesel probe for the smoke opacity test. Not a single center used jump cables to measure RPM of the vehicle. No procedure was followed at any center.

With the exception of one station, every PUC Center the team inspected issued the EPCA audit team a pass diesel certificate without checking the RPM or the conducting a thorough smoke test. The test procedure is also not standardized. The Flush cycle readings were different with a variation from 4 reading to 8 readings being taken to measure mean for the diesel vehicles.

V.K.PUC issued the audit team a pass diesel certificate without even having a smoke opacity meter. The center had license for both petrol and diesel testing, but had machines for neither.

Bulandshahr: In all the PUC centres audited, fake software was found. This software allowed manipulation by the operator, allowing them to generate randomized RPM's, CO, HC and HSU readings. These software alterations were fairly advanced, fixing the parameters for pass/fail of vehicles automatically, and there was a prepared menu of cars and makes with different pre-set values for RPM and HSU, independent of year of manufacturing. In an extreme case, there was no software at all present at a centre, but simply an Adobe Photoshop programme to manipulate and print the PUC. The software "Polcer" was a very common fake

<p>PUC programme used. There were 3 centers found operating without any emission analyzing machines at all. These were using altered software and were functioning openly, without any attempt to hide the fact that there was no machine. In all of the centres, there were shortcomings in terms of the certification, permits and validation of instruments. In most cases, calibration was done 2-3 years ago, or not done at all.</p> <p>As observed, in Gurgaon, most vehicles coming for the PUC inspection were taxis, under the compulsion of getting a PUC certificate which has validity in Delhi also. It was disclosed to the team that the taxi drivers opt to come to NCR to get a PUC pass certificate, which is mandatory to enter and ply in Delhi. They get the test done in Haryana rather than in Delhi as the system is known to be more lax in NCR than in Delhi.</p>	
<p>2.7 (2.8). Availability of qualified and skilled PUC operator (Qualification and training details)</p> <p>Delhi: All centres were found to be operators who are qualified (ITI Mechanical) and trained by the instrument manufacturer and transport department as per the requirement. In one centre an operator was not found as per the requirement and had little knowledge. But as a whole the operators must be trained and with on-site audit must be trained for following correct test procedure.</p> <p>Ghaziabad: The operator in four centres did not have any procedural knowledge about the testing procedures whereas in 60 per cent of the centre had well versed operators who aware of the testing procedures.</p> <p>Gautam Buddh Nagar: Except in one centre out of the five audited, operators for the rest were well versed with the testing procedures.</p> <p>Bulandshahr: Out of the 10 PUCCs audited, eight of them did not have the operators who had proper procedural knowledge for conducting the tests. In one of the centre M/s Shri Ganesh Paryavaran Samiti (centre code- 1004), operator just had the knowledge of test procedures for petrol vehicles and did not know about the procedures for testing diesel vehicles. In the centre Durga Paryavaran Samiti (centre code- 629), the operator had the knowledge about the testing procedures but didn't do the leak test from end of the pipe instead but didn't do the leak test from end of the pipe instead he did just by closing the nozzle of the machine</p> <p>In Haryana most PUCCs the operator trained by the OEM is not the one conducting the actual test. Even in the centers which were tended by the designated operator, the operator had no understanding or knowledge of the testing process. Moreover, there is an issue with the training methodology of the OEMs. The operators are given one day training in most cases. More clarity is needed in the duration and the knowledge imparted during such trainings. The trained operators did not have basic knowledge of how to take RPM readings or why it was relevant to the whole test. The authenticity of such a test is questionable.</p> <p>Gurgaon: Out of the 10 PUCCs inspected only 4 had the certified operator present, the rest were tended by assistants who had no knowledge of the systems. All 10 PUCC operators lacked any knowledge of the probe length, the RPM readings, the proper procedure to be followed. In all PUCC centers the software was tampered with. Pre-set readings were fed into the system. When enquired of they were ignorant of how the data was preset, only stating that this is how their software works. There is also an implicit non-compliance. When caught rigging the test by the team and asked to redo the test, the operator switched on the smoke opacity machine for the first time (A.K. PUCC).</p> <p>Faridabad: Only two trained operators, out the 5 inspected, was found to be</p>	<p>Draft report revils that in conducting audit it was found that in Gaziyabad, Gautam buddh nager and buland saher operators were not found/available. This is very embarrassing and it appears that officer of the concerned district of U.P. or not periodically inspecting the centers. Instructions will be sent again for auditing for inspection and audit of such centers and it will also taken seriously about the carelessness of the officers of the concern districts.</p>

<p>ignorant of the procedure to be followed. The rest were following the due procedure.</p> <p>Rohtak: 10 PUCCs, in Rohtak, were chosen through a random selection process for the physical audit. The state of equipment in the inspected in 10 centres show only one operator in 10 inspected centers had knowledge of the testing process. In 7 out of the 10 centers inspected the operator trained by the OEMs was not present and the test was conducted by an assistant instead.</p> <p>Absentee Operator: In Rohtak for instance, only in three PUC centers had trained operators attending the center. In most cases the assistant conducted the test, with no knowledge of the testing process and the method of maintaining equipments. Training programmes for operators have been found to be inadequate. it is not comprehensive training that is being imparted to the operators. Basic IT knowledge is the qualifying criteria so that the operators can operate the basic functions on a computer. The training programme of various OEMs last only for a day to 3 days. Uniformity will have to be maintained in this regard to ensure operators have full understanding of the physical as well as computer maintenance of the machines.</p>	
<p>2.8 Inspection framework of the RTOs</p> <p>Licensing and certificates: The role of RTO is crucial for effective implementation of the PUC system. Issues of space and procurement of equipment can be assessed at the time of issuing licensing. This protocol however is not conducted with diligence as in numerous instances highlighted above, licenses are issued to PUC agencies who do not have a diesel testing machine and so forth do not display certificates. The local RTOs are yet to make it mandatory for all PUCCs to display their certificates. The issue of absentee operator can be addressed by mandating display of certificates (AMC, type approval, training and calibration certificate). Thus anyone coming for PUC check can attest whether the person conducting their test is the trained operator or not.</p> <p>Delhi: All the operators said that transport department carries out time to time inspection, periodicity needs to be verified from the transport department. CPCB also carries out audits.</p> <p>Rohtak: The licensing process in the Rohtak RTA, involves a formal application, with submission of documents of type approval, trainee certificate and agreement between the petrol pump owner and the PUC Licensee. The licensing Authority would then scrutinize the same and after a site visit would issue a license. The RTO stated that they conduct inspection every 6 months. This could not be validated from field.</p> <p>Faridabad: The licensing process in the Faridabad RTA, involves a formal application, with submission of documents of type approval, trainee certificate and agreement between the petrol pump owner and the PUC Licensee. The licensing Authority would then scrutinize the same and after a site visit would issue a license. The RTO has specific targets for each month. They have a dedicated team to conduct inspections of PUCCs. They have a set of target of 5 centers in a week. Faridabad has seen fairly better compliance rate, when compared to Rohtak and Gurgaon, primarily due to the initiative of the local RTO</p> <p>Faridabad has a very active system where the local RTO pushed for the PUCCs in the region to get their hardware upgraded or their licenses would be revoked. This ensured the old hardware and broken machines were all replaced with new upgraded machines. The RTO also submit monthly report to the Chandigarh head office thus ensuring the data on PUC is regularly updated.</p> <p>The compliance of the PUC agency is ensured by inspection by RTOs and the action on non-compliance is usually brought through verbal warning, suspension of license and as a penultimate revoking license.</p> <p>Bulandshahr: Many of the PUC centres in this district were seen operating without</p>	<p>on this point report against revills week inspections frame work of the ARTo Puc Center and proper easements and inspection of such centers at the time of recommendation for licensing and certification this is very serious issue. It appear that before making requmandation for licensing of Puc center proper inspections, all though joint inspection are to be done, are not being done by the concern authorities.</p> <p>Serious view will be taken by the department against such erring officers and fresh instruction will be such soon to be very careful before sending and recommending of such centers.</p>

any license, only one centre had the license but then it was an invalid one. Although there is a requirement for the operator to prominently display his license, operator's training, documentation of the emission analysis machines and other necessary certification, this was missing at all the centres audited. Such lack of compliance with the rules established by the state indicates a lackadaisical approach towards enforcement. Although there are "time-to-time inspections" of the PUC centres, such a state of non-compliance points towards these enforcement techniques being insufficient and inefficient.

Gautam Buddh Nagar: Two centres in the district did not have the license to operate. In the rest three centres all the certificates were displayed

Ghaziabad: The license was missing from most of the centres i.e., 8 out of 10 did not have licenses with them and neither they had a training certificates. In one case, we even saw a blank pre-signed training certificate, which means that anyone can write their name on it.

Gurgaon: The licensing process in the Gurgaon RTA, involves a formal application, land is identified, a site check is conducted, and condition of the machine is ascertained. The licensing Authority would then scrutinize the same and after a site visit would issue a license.

The RTO officials in interview stated that they conduct regular periodic inspection every 2-3month. However their inspection method is rather suspicious as they choose to inform the PUCs beforehand when they conduct inspection rounds in their regions. They have been active in weeding out mobile pollution checking centers and have been effective in their efforts.

Rohtak and Gurgaon have no compliance strategy. They operate on a command approach. The enforcement system is solely based on ground inspection. The avenue of doing a review during renewal of license is lost, as data from the archives is not analysed neither is a site inspection carried through to check on state of machines, which are critical for the whole PUC system to give authentic results.

General problem faced in the region with the organization of the PUC centres
Display of certificates: It is still not mandated by the local RTOs to display the four crucial certificates(type approval, AMC, calibration and training certificate)

Log books: The PUCs in all the three regions recently started maintaining log books (EPCA Format), it is still not made mandatory by the local RTO. The method used to maintain unofficial logs by the PUC operator is to maintain a customer care register where he only notes the vehicles number, date of check and mobile number to remind the customer of the renewal of PUC. The owner of the PUC center can collect the archival data from the software of the machine itself. But legitimacy of such logs can be questioned when most softwares don't support storing archival data.

Issue of space: Not all centers had space to place a vehicle for check. Often the stationary vehicle for inspection would be in the way of traffic or the vehicles coming in/going out of the fueling station. This would have been corrected if the site visit is conducted thoroughly before granting license. A discrepancy which points to lax inspection of the local RTO.

Renewal of License/ Reinspections: Requirement of AMC of machines and type approval certificates are not mandatorily followed by Gurgaon and Rohtak, during granting of license. 5 PUCs in Rohtak, one in Faridabad and 4 PUCs in Gurgaon, did not have diesel machines but had recently renewed their licenses. The license was displayed at the PUC of the same. The RTA officials clearly do not conduct site inspections before renewing the license. Such practices mean that the license continues to be in operation despite the machines not working, or in certain cases

<p>there not being a machine at all. The type approval certificate is NOT a proof of acquiring a machine.</p> <p>Mobile Centers: In gurgaon, when asked about the issue of mobile PUCCs, the RTO claimed that such mobile PUC units are illegal and that steps were taken to remove them from the region. Licenses have been cancelled and machines have been impounded, which the owners are yet to come claim for. The RTO stated that the do not grant license for mobile units as it is supposed to be "attached to the land". However the licensee may move it from the designated location in a petrol pump and sets it up as a mobile unit, witout their permission.</p> <p>In Uttar Pradesh cities all the operators said that transport department carries out time-to-time inspection. Some of the centres were inspected on the same morning in Ghaziabad on the day we visited the district.</p>	
<p>3.10 . Challan and penalty for user of vehicles for non-compliance in NCR states The official data on enforcement in terms of challan, penalty, inspection etc is still very inadequate. As per the latest amended Central Motor Vehicle Act of 1988 under Section 190(2), for violation of road safety, noise and air pollution rules, the fine for first offence has been revised from Rs. 1000 to up to 3 months jail or Rs. 10000 or both, along with suspension of license for 3 months. For subsequent offences, fine has been revised from Rs. 2000 to up to 6 months jail or Rs. 10000 or both. Only Uttar Pradesh government has shared a set of data on this matter. Additional information provided by Gurgaon RTO, about the challan process that they had impounded the mobile PUCCs and other equipments which are yet to be claimed by the owners and till they do so they cannot register challan and hence do not have the quantified information on the same. The inspection regime is also very weak. Gaziabad has only 9 inspectors, Gauta Budhh Nagar 7, Bulandshahr 2. The number of challans is a few hundred for the specified period. Clearly this renders the system more ineffective.</p>	<p>The report in corporate the official data of on enforcement in terms of challan/ penalty/inspection and which is very inadequate reports also revills that for violation of air pollution provision total no. of Puc centers is situated Gaziabad 114, Guatam Buddh Nager 72, Buland saher 48 and Hapud 28. Such center in 2016 and 2017 only 80 centers in Gaziabad, 65 in Guatam Buddh Nager, 48 in Buland saher and 28 in Hapud were inspected and out of which 17 in Gaziabad, 44 in Gutam Buddh Nager, 33 in Buland saher and 23 in Hapud were found who followed the standards and the centers who plouted standerds were found in 36 in Gaziabad, Nil in Gutam Buddh Nager, 15 in Buland saher and Nil in Hapud. During the inspection 27 centers in Ghaziabad, 21 centers in Gutam Buddh Nager, 15 centers in Buland sahar and 5 centers in Hapud were found closed in during inspections. In view of above the draft report says that is very week and no. of challans are also very less. Which clearly the vendors the system more in effective.</p>
<p>3.11.Phase in centralized testing centres that are capable of conducting large volume of automated tests: These tests can minimise the chances of cheating and manipulation. These can be introduced first for the commercial vehicles.</p>	<p>Agreed</p>
<p>3.12: India has already specified more advanced On Board Diagnostic Systems in post 2013 vehicles. This should be integrated with vehicle inspection programme for more effective monitoring: If a problem or malfunction is detected, the OBD II system illuminates a warning light on the vehicle instrument panel to alert the driver. This warning light will typically display the phrase "Check Engine" or "Service Engine Soon," and will often include an engine symbol. The OBD system stores important information about any detected malfunction so that a repair technician can accurately find and fix the problem. It is notified to monitor catalyst, fuel Injection system, particulate trap, coolant temperature, EGR, fuel system, emission control systems, etc. Smog Check inspections in USA for post 2000 model vehicles are now primarily based on an inspection of the OBD II system; Tailpipe testing is no longer required. Identifies emission-related components covered under warranty This eliminates unnecessary repairs; give information about area of malfunction or</p>	<p>Agreed</p>

a specific component; this reduces cost of warranty repairs / customer satisfaction; allows early detection of malfunctions; and prevents malfunctions detect misfire before catalyst damaged etc. But this system will require strong surveillance and appropriate software to work effectively. In Europe OBD system often failed to detect high emissions from diesel cars.

The OBD system stores important information about any detected malfunction in vehicles so that a repair technician can accurately find and fix the problem. Identifies emission-related components covered under warranty; eliminates unnecessary repairs

Fault codes and other scan tool data give information about area of malfunction or a specific component. Consumer protection

All positive Ignition Vehicles

Indian OBD I vehicles (April 1, 2010): Oxygen sensor, Secondary Air system, Coolant temperature, Exhaust Gas Recirculation, circuit continuity for all emission related power train components and Distance travelled since Malfunction Indicator Lamp ON

Indian OBD II vehicles (April 1, 2013): Catalyst, Misfire, Oxygen sensor, Secondary Air system, Coolant temperature, EGR, Fuel tank leakage and evaporation, Fuel system, circuit continuity for all emission related power train components and Distance travelled since MIL ON

All Compression Ignition Vehicles

Indian OBD I vehicles (April 1, 2010): Fuel Injection system, Coolant temperature, EGR, Fuel system, Emission Control systems/ components, Circuit continuity for all emission related power train components and Distance travelled since MIL ON

Indian OBD II vehicles (April 1, 2013): Catalyst, Fuel Injection system, Particulate Trap, Coolant temperature, EGR, Fuel system, Emission Control systems/ components, Circuit continuity for all emission related power train components and Distance travelled since MIL ON

Global action on OBD

US/California: Newer vehicles equipped with OBD II require an OBD check as part of their official Smog Check inspection. For newer there is no tailpipe inspection. For older model-year vehicles, the Smog Check include a tailpipe test and a visual inspection

Germany: In Germany the Ministry of Transport used a clause in the EU directive which allows replacing the emission test by checking the OBD.

The UBA and environmental NGO are fighting against this practice now.

Very recently the minister of transport has announced to reintroduce the end of pipe emission test as the OBD isn't working properly.

The current practice of pollution under control programme (PUC) is not designed to address complex emissions control systems in new vehicles that will come in 2020 under new Euro VI regime.

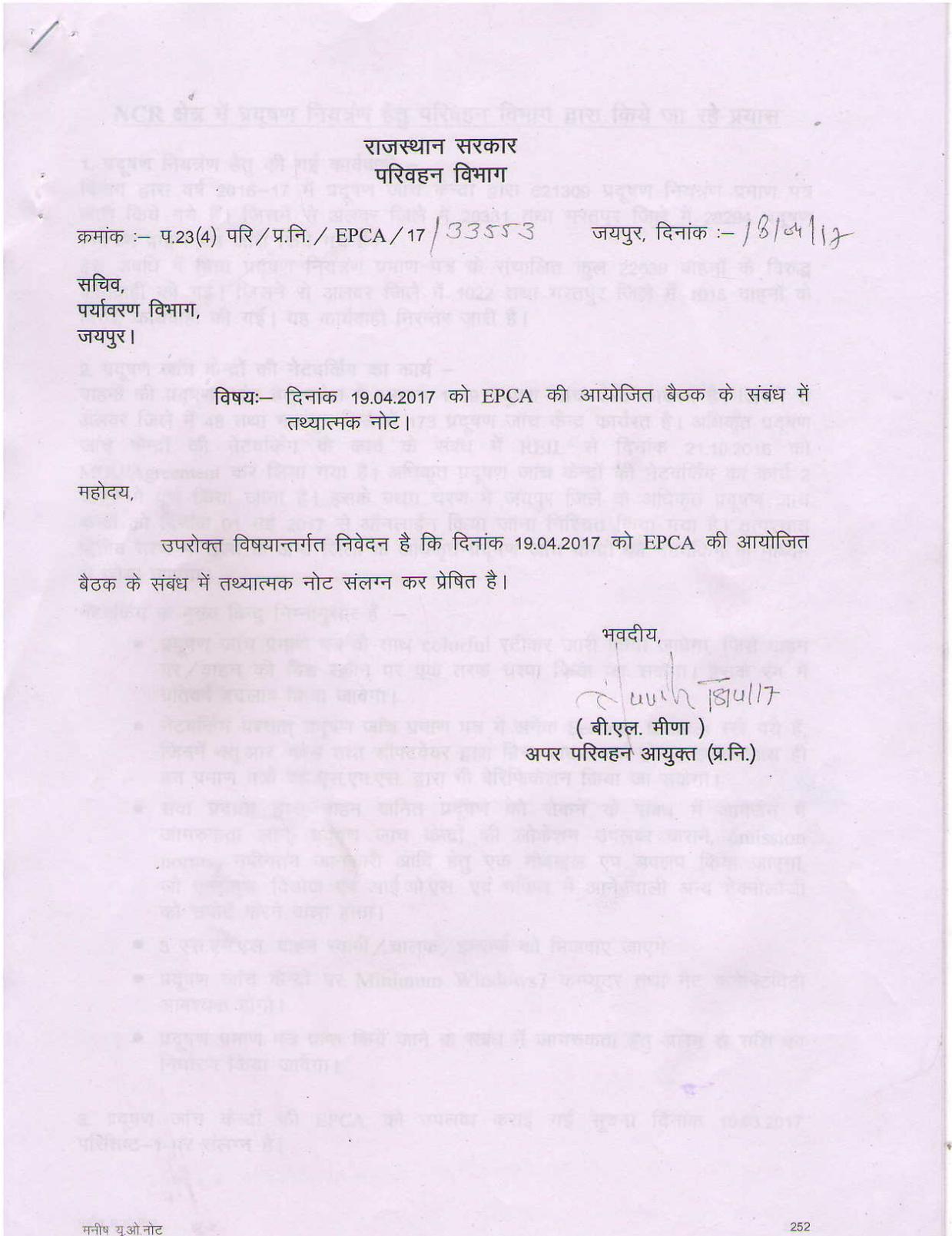
PUC cannot screen inherent technical flaws and frauds for which manufacturers are responsible that compromise the emissions performance in the real world. The fact that India is totally unprepared to prevent emissions frauds and underperformance of emissions control systems on roads, was proved few years ago when the Tavera fraud case of General Motors was exposed. These models passed certification test with one set of engines that did not the match those actually sold in the market. But this incident did not lead to any major reform to establish in-use compliance norms and monitoring in India. Indian government does not have the power to penalise the manufacturers for non-compliance and violation. This has serious implications as the next level of Euro V and Euro VI standards will require advanced particulate traps and NOx control systems like SCR to cut toxic diesel emissions. If engineering deficiency reduce effectiveness of these systems or if these are not properly operated like urea refilling in SCR system it can lead to uncontrolled emissions and nullify pollution control in cities.

<p>2.9. Euro VI emissions standards to bring new compliance regime: Ensure this works properly:</p> <p>For the first time monitoring of real world emissions with portable monitoring system along with in-service compliance regulations will be implemented to keep an eye on real world emissions. Real driving emissions (RDE) testing will be included as an additional requirement for vehicle certification. Emissions measurements will be carried out with the help of Portable Emission Measurement System (PEMS) and onwards in-service conformity factor will be applied to ensure that emissions from vehicles remain within the stated margin. This can prevent emissions cheating and use of sub standards emissions control or defeat devices as was done by Volkswagen. However, adoption of more advanced on-board diagnostic system has been delayed until 2023. Moreover, higher durability requirements in BSVI can ensure that emissions stay low throughout the useful life of the vehicle. The test procedures are to become more rigorous. World Harmonized Light-duty Vehicle Test Cycle (WLTC) will replace the New European Drive Cycle (NEDC), and a variety of test parameters will be adjusted to close loopholes and address shortcomings of the current procedures. Thus, ensuring that the emissions control equipment is functioning through the most productive lifetime is especially critical for long-lived and intensively-used diesel vehicles. The Volkswagen case demonstrates that poor emissions performance not only adds to public health risk but also increases business risk for the industry.</p>	<p>Agreed</p>
<p>3. India needs strong compliance regulations to make manufactures responsible for on-road emissions performance for its useful life on road:</p> <p>Consistent with the global best practice India needs independent authority to check emissions against standards; issue recall of vehicles by companies if they are found non-compliant; levy fines on defaulting companies; and withdraw approval of sale if vehicles do not conform with the stated emissions targets. An independent authority without the influence of the industry should monitor this process. Only such a system will make non-compliance with regulations more expensive for the companies than compliance with regulations and ensure implementation. Auto Fuel policy committee has recommended emissions warranty and recall programme and in-use compliance regulations. But this has not been implemented.</p> <p>CSE's review shows that currently, Indian certification agencies do not select vehicle samples for certification tests randomly and independently. In fact, certification agencies give prior notice to manufacturers about the approximate time during which samples will be collected from a given lot. This compromises independent and impartial testing. Legal procedures for the MoRTH to issue mandatory recalls or levy fines have not been established yet.</p> <p>Moreover, after sales there is no system like that in the US etc, to allow testing agencies to select any vehicle, anywhere, and at any time, without prior notice to the manufacturer. India urgently needs rules for government and manufacturer to remove noncompliant vehicles. Mandatory recall policy for noncompliant vehicles is needed to ensure that manufacturers design vehicles to comply with emission standards for the duration of their useful life.</p> <p>In fact, China has taken steps to move in this direction. China has recently revised its programs to allow the selection of vehicles at random without any prior notice. Furthermore, COP testing in China is now corroborated through inter-laboratory round-robin testing, which adds an additional level of scrutiny.</p> <p>Need defeat device regulations: CSE investigation has shown that defeat devices are being sold openly in the global market. For instance, Adblue OBD2 Emulator that disables selective catalytic reducing (SCR) system needed to control NOx from diesel vehicles are being openly sold in the global market. People use this to avoid recurring cost of urea refill in SCRs. In countries like Brazil only 46% of the diesel vehicles have working SCRs -- rest have been disabled. Thus, India needs defeat device regulations like the countries like the US has.</p>	<p>Agreed</p>

<p>Recommendations of EPCA</p> <p>Without a robust system of emissions monitoring and compliance, the investments in emission control systems in vehicles to meet tighter emissions standards at the time of manufacturing vehicles can go waste and negate air pollution control efforts in our cities. Therefore, the following recommendations are made:</p> <p>For improved compliance with the PUC programme:</p> <p>Ensure 100 per cent compliance by linking annual vehicle insurance with PUC certificates. Annual vehicle insurance cannot be obtained without all the requisite PUC certificates. Periodicity of PUC certificate can be standardized across the NCR.</p> <ul style="list-style-type: none"> • Introduce automatic online network for transmission of PUC data to the central server to minimize manual interference and allow proper analysis of data for remote auditing of PUC centres. Adopt uniform and standardized data recording and reporting format and uniform software across Delhi NCR. Mandate periodic analysis of data to refine enforcement and for monitoring and submission of compliance report every 6 months. • Mandate pre-payment of PUC fees before the tests are conducted • Strengthen inspection of the PUC centres for quality control but phase in big centralized emissions testing centres capable of conducting automatic and upgraded tests for commercial vehicles on a priority basis. Delhi already has Burari vehicle inspection and fitness centre in Delhi for commercial vehicles. This may be made operational for high level of automatic emissions testing. Ministry of Road Transport and Highways is also setting up centralised inspection centres in NCR. These should be aligned to firm up the roadmap. <p>For improving the effectiveness of the PUC tests and inspection</p> <ul style="list-style-type: none"> • Tighten the PUC emissions norms for pre-Bharat Stage IV vehicles: Analysis of large data set on actual emissions concentration tested in large number of PUC centres in Delhi and UP has also brought out that the actual observed emissions values of pre-Bharat Stage IV vehicles are significantly lower than their prescribed norms. In most cases 80 per cent lower than the limits. These norms cannot identify at least 15 to 20 per cent grossly polluting vehicles in the on-road fleet. Nearly all vehicles pass the tests. The overall failure rate is 4.69 per cent. For the diesel vehicles tested, the failure rate stands at 1.61 %, compared to 5.18 per cent for petrol vehicles and 4.65 per cent for all other fuel categories. requires urgent attention and action. Ministry of Road Transport and Highways need to tighten the PUC standards for the pre-Bharat Stage IV emissions standards. • Overhaul emissions tests and tighten norms for diesel vehicles: The review of available data shows that the smoke density test – the only test that is carried out in diesel vehicles is very lax for the pre-Bharat Stage IV diesel vehicles. Close to 95 per cent of vehicles tested show smoke density levels that are below the norm prescribed for the Bharat Stage IV vehicles. Therefore, the current norms for Bharat Stage IV norms should be made uniform for the pre-Bharat Stage IV vehicles as well and further tightened to 40 HSU. Moreover, as explained earlier globally smoke tests are being upgraded with more advanced test procedures to make these tests more rigorous and effective. Ministry of Road Transport and Highways may review those advanced testing procedures and provide a roadmap for their introduction in the large centralized testing centres for commercial vehicles. • Integrate OBD with inspection and maintenance programme: Ministry of Road Transport and Highways need to develop the protocol for implementation of OBD for vehicle inspection. This will complement the physical testing. 	<p>Agreed.</p> <p><u>Comments-</u> In the draft report at the appropriate places on this point the comments already been given, hence not to be repeated again.</p> <p>It will be mandated.</p> <p>Agreed and road map shall be prepared to strengthen inspection regime of the Puc center for quality control.</p> <p>Agreed.</p> <p>In view of very lesser failure rate in pollution test of vehicle in NCR area situated in U.P. PUC tests and inspections rigging will be improve to make centers more effective.</p> <p><u>Comments-</u>Agreed, but it is to be done by amending rule 115 of the central Motor Vehicle Rules, 1989 by ministry of Road Transport and National Highways.</p>
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<p>Preparedness for advanced in-use emissions monitoring programme</p> <ul style="list-style-type: none"> • Provide roadmap for advanced emissions monitoring of new generation vehicles to come with Euro VI emissions standards in 2020: Any roadmap for improving vehicle inspection programme will have to keep in view the dramatic transition in vehicle engine technology that the market will witness in three years from now when Euro VI emissions standards will be enforced. The notification of the Ministry of Road Transport and Highways on Euro VI standards requires introduction of Real Driving Emissions Test Procedures and Standards based on portable emissions monitoring system to monitor emissions as vehicles move on the road. This is needed to ensure that all the advanced emissions control devices that to be fitted in the new vehicles will continue to perform effectively in real world. This is needed in view of the large deterioration in emissions noted in new vehicles even after meeting tighter emissions standards in Europe and the US and to prevent use of defeat devices. 	<p><u>Comments</u>-Agreed, but it is also to be developed by the ministry of Road Transport and National Highways.</p> <p><u>Comments</u>-Agreed This is about preparedness for advanced in use emissions monitoring for new generations vehicle to be manufactured with Euro Six emissions standards in 2020. As notified by the Ministry of Road Transport and Highways on Euro-VI Standards which required introduction of Real Driving Emissions Test Procedures and Standards based on portable emissions mentoring system as vehicles move on the road.</p>
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Annexure 7: Comments received from the Department of Transport, Government of the Rajasthan on April 18, 2017



NCR क्षेत्र में प्रदूषण नियंत्रण हेतु परिवहन विभाग द्वारा किये जा रहे प्रयास

1. प्रदूषण नियंत्रण हेतु की गई कार्यवाही -

विभाग द्वारा वर्ष 2016-17 में प्रदूषण जांच केन्द्रों द्वारा 621309 प्रदूषण नियंत्रण प्रमाण पत्र जारी किये गये हैं। जिसमें से अलवर जिले में 20331 तथा भरतपुर जिले में 28294 प्रदूषण नियंत्रण प्रमाण पत्र जारी किये गये हैं।

इस अवधि में बिना प्रदूषण नियंत्रण प्रमाण पत्र के संचालित कुल 22639 वाहनों के विरुद्ध कार्यवाही की गई। जिसमें से अलवर जिले में 1022 तथा भरतपुर जिले में 1015 वाहनों के विरुद्ध कार्यवाही की गई। यह कार्यवाही निरन्तर जारी है।

2. प्रदूषण जांच केन्द्रों की नेटवर्किंग का कार्य -

वाहनों की प्रदूषण जांच हेतु प्रदेश में लगभग 1159 प्रदूषण जांच केन्द्र कार्यरत है। जिसमें से अलवर जिले में 48 तथा भरतपुर जिले में 173 प्रदूषण जांच केन्द्र कार्यरत है। अधिकृत प्रदूषण जांच केन्द्रों की नेटवर्किंग के कार्य के संबंध में REIL से दिनांक 21.10.2016 को MOU/Agreement कर लिया गया है। अधिकृत प्रदूषण जांच केन्द्रों की नेटवर्किंग का कार्य 2 चरणों में पूर्ण किया जाना है। इसके प्रथम चरण में जयपुर जिले के अधिकृत प्रदूषण जांच केन्द्रों को दिनांक 01 मई 2017 से ऑनलाईन किया जाना निश्चित किया गया है। तत्पश्चात् द्वितीय चरण में राज्य के अन्य जिलों के अधिकृत प्रदूषण जांच केन्द्रों को नेटवर्किंग के माध्यम से जोड़ा जाएगा।

नेटवर्किंग के मुख्य बिन्दु निम्नानुसार हैं :-

- प्रदूषण जांच प्रमाण पत्र के साथ colorful स्टीकर जारी किया जावेगा, जिसे वाहन पर/वाहन की विंड स्क्रीन पर एक तरफ चस्पा किया जा सकेगा। इसके रंग में प्रतिवर्ष बदलाव किया जावेगा।
- नेटवर्किंग पश्चात् प्रदूषण जांच प्रमाण पत्र में अनेक Security features रखे गये हैं, जिनमें क्यू.आर. कोड तथा सॉफ्टवेयर द्वारा प्रिन्ट वाटर मार्क होगा। इसके साथ ही इन प्रमाण पत्रों का एस.एम.एस. द्वारा भी वेरिफिकेशन किया जा सकेगा।
- सेवा प्रदाता द्वारा वाहन जनित प्रदूषण को रोकने के संबंध में आमजन में जागरुकता लाने, प्रदूषण जांच केन्द्रों की लोकेशन उपलब्ध कराने, emission norms, नवीनतम जानकारी आदि हेतु एक मोबाइल एप डवलप किया जाएगा, जो एन्ड्रॉइड, विंडोज एवं आई.ओ.एस. एवं भविष्य में आने वाली अन्य टेक्नोलॉजी को सपोर्ट करने वाला होगा।
- 3 एस.एम.एस. वाहन स्वामी/चालक/इन्चार्ज को भिजवाए जाएंगे
- प्रदूषण जांच केन्द्रों पर Minimum Windows7 कम्प्यूटर तथा नेट कनेक्टिविटी आवश्यक होगी।
- प्रदूषण प्रमाण पत्र प्राप्त किये जाने के संबंध में जागरुकता हेतु अलग से राशि का निर्धारण किया जावेगा।

3. प्रदूषण जांच केन्द्रों की EPCA को उपलब्ध कराई गई सूचना दिनांक 10.03.2017 परिशिष्ट-1 पर संलग्न है।

Annexure 8: Minutes of the EPCA meeting held on April 19, 2017**Minutes of the Meeting of the reconstituted EPCA for NCR region held under the Chairmanship of Shri Bhure Lal at 11:30 am on 19.4.2017 in the office of Supreme Court Monitoring Committee, Core 6A, Third Floor, India Habitat Centre**

Agenda items: Review of the report prepared by EPCA on working of Pollution Under Control Centres in Delhi & NCR.

In attendance**Chairman and Members EPCA**

1. Dr. Bhure Lal, Chairman, EPCA
2. Ms. Sunita Narain, Member, EPCA
3. Mr. Trilok Chand, EE, DPCC
4. Dr. Ramesh Kumar, CMO, NDMC
5. Mr. O.P. Sharma, CSI (Health), NDMC
6. Mr. R K Singh, EE, East Delhi Municipal Corporation
7. Mr. Pramod Vashisht, AE, North Delhi Municipal Corporation
8. Mr. Ravinder Soni, ACP, Delhi Traffic Police
9. Mr. Atanu Ganguli, Senior Director, SIAM

Representatives of concerned agencies

1. Mr. Anil Banka, Spl. Commissioner, Transport Dept., GNCTD
2. Mr. V.K. Saraswat, PCO, Transport Dept., GNCTD
3. Mr. Trilok, Secretary, RTA, Gurugram, Haryana
4. Mr. V.K. Singh, Addl. Transport Commissioner, Meerut, Transport Department, U.P.
5. Mr. A.K. Singh, RTO, Ghaziabad
6. Mr. Nanu Ram Choyal, RTO, Bharatpur, Transport Department, Rajasthan
7. Ms. Garima Sharma, EE, CPCB
8. Mrs. Meetu Puri, SSA, CPCB

EPCA convened this meeting to obtain the comments on the draft PUCC report No. 73 circulated to its members and Govt. of Delhi, Haryana, Uttar Pradesh and Rajasthan and to finalize the report based on the comments.

The state-wise responses are as under:

Govt. of Delhi

Representative of Transport Department, Delhi informed that the comments on the report have already been submitted to EPCA on March 17, 2017 and there are no additional suggestions/ comments on the report.

Govt. of Haryana

Representative of Transport Department, Haryana informed that the report has been examined and there are no suggestions/ comments on the report.

Govt. of Uttar Pradesh

Representative of Transport Department, U.P. informed that the comments on the report have already been submitted to EPCA on March 26, 2017 and there are no additional suggestions/ comments on the report.

Govt. of Rajasthan

Representative of Transport Department, Rajasthan informed that the report has been examined and there are no suggestions/ comments on the report. He further informed that the process of linking PUC

centres to a centralized server is ongoing and is expected to get completed by August, 2017.

All state governments also expressed the need to have uniform validity of PUC certificates across all NCR states. The validity of calibration certificates is also unequal across different states. EPCA responded that the PUC regime needs to be strengthened in terms of compliance and tighter emission standards, following which the periodicity of tests can be looked into. However, it agreed to the need having uniform validity for calibration certificates, which is on a quarterly basis.

Comments of Members, EPCA on draft comprehensive action plan

1. Relaxation of procedure for free acceleration test for diesel vehicles

The SIAM representative expressed that there is no relaxation in the test procedure as mentioned in EPCA's report and explained that MoRTH's 2015 notification was meant to simplify the procedure. EPCA responded that this simplification allows most diesel vehicles to pass through the test. EPCA said that SIAM's point of view will be included in the report.

2. Smoke Opacity standard of 40 HSU for diesel

SIAM representative expressed that the suggestion made by EPCA for making the standard for smoke opacity more stringent is based on data analysis of only 23% of registered vehicles in NCT, as per EPCA's own study. Hence, this data may not be adequate and SIAM suggests that an independent study may be carried out. In addition, various Pre-BS IV vehicles have not been manufactured to comply with a smoke opacity standard of 40 HSU. EPCA responded saying that the sample size for the study was not small, and that there was a huge margin between the norm and the observed value for HSU for most of the diesel vehicles tested. Based on this analysis, the standard for smoke opacity should be made stringent. It stressed on making a common, stringent standard for both BS IV and pre BS IV diesel vehicles

3. RDE integration with PUC

The SIAM representative raised a concern that RDE testing, which is a part of the upcoming BS VI in-use vehicular compliance regime is being conflated with the PUC testing regime. While PUC is administered by the state transport department through various RTA's, the RDE testing mechanism will be through centralized testing agencies. EPCA responded to this saying that the issue of RDE testing was important in view of documented malpractices in India and other countries, and its report highlighted that the MoRTH needs to come up with a compliance mechanism for RDE testing.

4. Case of VW and GM Tavera

The SIAM representative expressed that no records were available with SIAM of the use of defeat devices in VW vehicles in India. He also mentioned that after the reports of the Nitin Gokarn committee, some of the recommendations have already been implemented which make changes in the way sampling is done for Conformity of Production tests. EPCA responded that it has received communication from ARAI that such defeat devices in VW vehicles have been used in India as well, and that the Gokarn committee recommendations and its implications have been included in the report.

5. Testing of Oxides of Sulphur, Nitrogen and Particulate matter for Diesel vehicles

The representative of CPCB raised the concern that the current PUC testing regime for diesel vehicles does not take into account emissions of SO_x, NO_x and PM. EPCA responded that this is a point of concern and the existing PUC system will need to be overhauled for testing of these pollutants, since they can only be tested at centralized Inspection and Certification centres, and not at existing PUC centres. This has been included in the report.

6. Clash between OBD and RDE

The representative of CPCB raised the concern that with the large investment needed to introduce RDE testing, the current and future OBD technology would be made redundant. EPCA clarified that its report asked for use of RDE testing as an additional tool over existing OBD systems in the form of MIL indicators, which would be integrated into a single emission control system.

7. Need for periodic third party Audits

The representative of CPCB expressed that there needed to a provision for periodic regular third party audits, including checks for calibration. EPCA agreed to this, and said that a recommendation for annual third part audits to be done by the State Pollution Control Boards along with the State Department of Transport of NCR states to be submitted to EPCA will be included in the report.

The meeting ended with a vote of thanks to the chair.

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Annexure 9: Video documentation of malpractices captured during EPCA's field audit

(Pen Drive enclosed with the report)