

**EPCA Report no.85**

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

**Report to Hon'ble Supreme Court on Improvement in testing parameters in vehicles under Pollution under Control (PUC) Programme**

**Environment Pollution (Prevention and Control) Authority for Delhi NCR**

**April 25, 2018**

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## **Improvement in testing parameters in vehicles under Pollution under Control (PUC) Programme**

**April 25, 2018**

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### **1. Directive of the Hon'ble Supreme Court**

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The Hon'ble Supreme Court in its order March 23, 2018 has directed EPCA to examine the new parameters that can be introduced in Pollution under Control (PUC) centres.

EPCA has reviewed the global practices to assess the potential of adopting testing of additional parameters including nitrogen oxides (NOx) and particulate matter (PM) in petrol and diesel vehicles under inspection and maintenance programme as these are the key pollutants of concern.

### **2. Petrol vehicles**

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Under the current PUC programme carbon monoxide (CO) and hydrocarbon (HC) concentration is measured at two speed idle tests along with lambda measurement in four wheelers fitted with three way catalytic converters. Lambda is a measure of air to fuel ratio that if kept at the optimal level for which the vehicles have been designed it enables the right condition for the three way catalytic converters to function properly. This is needed to ensure emissions control system is working effectively to control emissions from petrol vehicles. Carbon monoxide and hydrocarbon concentration is also tested in other petrol vehicles including two wheelers.

For the current generations of on-road fleet EPCA recommends continuation of these tests in both petrol and CNG vehicles and ensure tests are credible and authentic.

Globally, the additional parameter that is tested in petrol vehicles is nitrogen oxide (NOx). This as practiced in the US/California and China show that this is a loaded test called Acceleration Simulation Mode (ASM) test and iM240 that are

conducted on dynamometer to simulate speed to put load on the vehicle while testing. These have better capabilities to identify high NO<sub>x</sub> emission and malfunctions in air-fuel control and emission and after-treatment systems. This improved test requires advanced testing equipment like dynamometer that cannot be introduced in decentralised numerous PUC kiosks in India. These will require centralized testing centres capable of conducting high volume of automated tests.

### **3. Diesel vehicles**

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Currently only free acceleration smoke test or snap acceleration test that measures smoke emissions from diesel vehicles has been adopted for PUC testing in India. This test serves as a rough indicator of serious emissions malfunctions but studies have shown that this test does not correlate well with any driving cycle used for mass emission tests conducted during certification of new vehicles and is not a very reliable test. Many studies have also shown that the correlation between exhaust smoke opacity and particulate emissions from diesel vehicles is weak. Low visible smoke does not mean less particulate emissions, which is very harmful. Moreover, if vehicles are tuned for very low smoke there can be tradeoff with higher NO<sub>x</sub> emissions.

To improve these smoke tests further, countries like the US, China, Singapore and Hong Kong have adopted loaded lug down smoke test. “Lug down” means to slow the engine by raising its load) and requires placing the vehicle on a dynamometer. Lug-down test is effective at detecting high emitters. Lug-down testing show reasonable correlation with emissions in the more representative drive cycles carried out during chassis testing.

Only in Australia diesel test called dT80 has been implemented on a limited scale to test both PM and NO<sub>x</sub> from heavy duty vehicles. This test requires the use of a chassis dynamometer. Experiments carried out in Australia found that emissions measured under the Dt80 have a high correlation with expected on-road emissions performance. This test is used for further testing of specific vehicles

with high emissions after vehicles have been screened with other methods including remote sensing techniques.

It may be noted that particulate matter and NO<sub>x</sub> measurements are not covered by the large majority of i/M programs as these require more expensive and complex instruments. New generation technologies that are coming with BSIV and BSVI and are fitted with advanced particulate filter and selective catalytic reducing system for NO<sub>x</sub> control will need more advanced tests. Globally, onboard diagnostic system has been integrated with inspection programs that determine the type and status of the emissions faults.

Additionally, remote sensing, a promising technique, has been adopted by other governments to complement their inspection and maintenance programme to identify high emitters on road. It is a light beam directed through the exhaust plume of vehicles passing by on road to measure the pollutant concentrations relative to the background air and provides instantaneous emission factor. A camera captures a picture of the license plate to allow linking of the emissions data to vehicle registration information and to engine family and model year or emission certification, vehicle owner etc. If repeated readings exceed high-emitter thresholds, the owner is notified for I/M testing. Remote sensing devices are common tools to screen vehicles, as the technique does not interrupt the flow of vehicular traffic. This is needed for clean screening, high emitter identification and on-road fleet monitoring and management. The cleanest vehicles or having emissions well below the standards can gain one more extra period before annual inspection is due. High emitters can be directed to further testing.

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#### **4. Recommendations of EPCA for the consideration of the Hon'ble Court**

##### **4.1. Petrol vehicles**

EPCA is not immediately recommending addition of new parameters for testing in petrol and CNG vehicles. All transport departments may be directed to ensure that credible and authentic tests of CO, HC and lambda – as the case may be - are conducted with strong quality control. If lambda is functioning properly that is needed for effective performance of three way catalytic converters in four

wheelers NOx can be kept under control. It is not practical and is not possible to introduce dynamometer testing in PUC centres that is needed for NOx measurements.

#### **4.2. Diesel vehicles**

Ministry of Road Transport and Highways and Automotive Research Association of India may be directed to give a roadmap for upgrading the current smoke test for diesel vehicles to lug-down tests on dynamometers. This is immediately possible for diesel vehicles. This system can also be further upgraded by adding PM and NOx measurement.

These tests can be done in big centralized inspection centres for commercial vehicles. This upgraded test is being currently conducted in China, Hong Kong, Singapore and the US. As India which dieselizing rapidly and heavy duty vehicles are source of high emissions this upgraded tests is important in commercial vehicles that in any case has to go for more elaborate roadworthiness tests annually to big inspection centres like Burari and Juljuli. These centres can be fully equipped to do these tests in commercial vehicles. Subsequently, once these facilities are properly established and expanded SUVs can also be tested on a priority basis, especially those identified from PUC screening.

Ministry of Road Transport and Highways may also be directed to provide their plans to set up centralized inspection centres like the one set up in Juljuli near Delhi for wider coverage of all commercial vehicles in Delhi and NCR. These centres are urgently needed to do high-level roadworthiness, safety and emissions inspection tests in commercial vehicles.

#### **4.3 Remote sensing**

Ministry of Road Transport and Highways and Automotive Research Association of India may be directed to assess and provide roadmap for introduction of road side remote sensing screening of emissions in Delhi and NCR to complement the current PUC system. These have already been piloted in Delhi, Pune and Kolkata. This upgradation is needed for proper large scale and quick emissions screening of on-road fleet for compliance and identification of high emitters on road.