

Vehicle Emissions Compliance for Light-Duty Vehicles in India

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Date: 20 August 2013

Keywords: Vehicle emissions regulation, compliance and enforcement, in-use testing, conformity of production, India, United States

Vehicle compliance and enforcement programs aim to ensure that vehicles emissions of particulate matter (PM), oxides of nitrogen (NO_x), hydrocarbons (HC), and carbon monoxide (CO) do not exceed the emission standards to which they were initially certified. Compliance tests attempt to limit any fraud from taking place during the certification process, and ensure that manufacturers build reliable products with guaranteed environmental performance over an established durability period.

Most countries with mature vehicle markets have compliance processes. Emerging vehicle markets, such as India and China, have generally have modelled their programs on European Union (EU) regulations. But EU regulations are splintered in that standards and certain norms are set by the EU as a whole, while each member state is responsible for developing its own compliance and enforcement mechanisms. Additionally, the EU lacks thorough in-use vehicle compliance programs to ensure vehicles are meeting standards throughout their useful lives.

In contrast to this, the United States Environmental Protection Agency (EPA) has had advanced compliance programs for decades now, and they are considered the most effective in the world.

This memo analyses compliance processes in India, assessing their strengths and shortcomings. It also looks at compliance regulations in the United States to put India's regulations in context and provide recommendations.

Vehicle compliance in the United States

The US vehicle compliance program is one of the oldest and most comprehensive compliance programs in the world. Full authority to regulate and enforce vehicle emissions was granted to the EPA under the Clean Air Act (CAA) in 1970. Since then, the EPA has strengthened and expanded its compliance programs based on experiences and needs.

The EPA conducts compliance testing at three different stages of a vehicle's life: pre-production, post-production, and in-use. The three programs are explained in detail below¹.

Pre-production Testing

In the US, manufacturers conduct initial emissions tests at their own expense and apply for a certificate of conformity for a vehicle model. This is usually done in the pre-production stage, before a vehicle goes on sale. Once manufacturers submit test results to the EPA, the EPA then conducts its own confirmatory tests on selected samples to verify that manufacturers' claims were correct. In recent years the EPA has selected about 10% of vehicle models for confirmatory testing. About half of these have tended to be randomly selected with the remainder targeted for confirmatory testing because of major design and technology changes.

¹ For full information on US vehicle emissions compliance programs, see the 2007 and 2008 Vehicle and Engine Compliance Activities Progress Reports: <http://www.epa.gov/otaq/about/420r08011.pdf> and <http://www.epa.gov/otaq/about/420r10022.pdf>

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Manufacturers are invited to see how the confirmatory tests are performed, and each vehicle model receives two opportunities to pass tests. If a vehicle fails the first test, the manufacturer is given the opportunity to inspect the vehicle and fix any problems before the second test is conducted. If the vehicle then fails the second test, the certificate of conformity is not issued. The manufacturer can then choose to not pursue certification for that vehicle, or it can make changes and reapply for a certificate. In the latter case, the entire process is repeated.

Post-production Testing

The EPA's selective enforcement audit (SEA) program was developed in the mid-1970s, when the EPA found some manufacturers were producing vehicles that did not comply with standards even though their prototypes passed confirmatory tests. Under the SEA program, the EPA can require manufacturers to test vehicles pulled off the assembly line, with no prior notice and at the manufacturer's expense, at an EPA certified lab. If the vehicles do not pass SEA tests, the vehicles' certificate of conformity can be revoked and its production must cease. In Europe and China, a comparable program is called Conformity of Production (COP) testing.

As the effectiveness of EPA programs increased, manufacturers found large percentages of their fleets facing mandatory recalls. This caused them to focus their efforts on designing durable products and putting in place internal self-audit systems to assure long-term compliance with standards. This way, manufacturers have the opportunity to fix problems before their certificate of conformity is revoked and their vehicles go on sale.

Since manufacturers have taken responsibility to ensure prototypes now represent vehicles they will be selling, the EPA rarely conducts SEA tests today. Nevertheless, the SEA program was initially necessary to catch violators of emission standards. The EPA retains the right to reinstate SEA testing if necessary.

In-use Testing

The EPA's in-use testing verification program (IUV) largely replaced the SEA program after the year 2000, and it has since become the cornerstone of its compliance and enforcement process. The cost to manufacturers of paying fines and having to recall vehicles already in use throughout the country is a strong incentive to produce them correctly the first time.

Under the EPA's IUV, manufacturers select random samples of their own vehicles according to EPA guidelines each year and, at their own expense, test emissions according to the vehicle's original emission standards. Vehicle owners are generally given financial

compensation or a substitute vehicle for the time their vehicles undergo testing.

Vehicles are tested in an "as received condition" during IUV testing, and test results are reported to the EPA. This helps the EPA assess how vehicles are really performing in the field under typical maintenance conditions. Since manufacturers are only responsible for "properly maintained" vehicles, an apparent failure to meet standards in IUV testing does not directly require a remedy or penalty. If a vehicle cohort of vehicles of the same model from a given year exceeds standards by more than 30%, the manufacturer must then perform an in-use compliance test program (IUCP). This is run the same way as the IUV except that vehicles are now screened for proper maintenance. In the case that vehicles fail IUCP testing, the EPA consults with manufacturers to fix the problem or issue voluntary recalls. If no solution is reached, the EPA may issue a mandatory recall of all noncompliant vehicles.

In addition to manufacturer testing, the EPA conducts its own testing, under its In-use Surveillance Testing (IUST) program, on a small sample of in-use vehicle testing to verify manufacturers' IUV test results. Vehicles are generally selected at random, or in some instances targeted testing occurs if there is reason to believe a set of vehicles are noncompliant.

The costs of fines and/or recalls due to noncompliance has been a strong incentive for manufacturers to conduct thorough IUV testing². This has led the EPA to decrease the number of its own tests, which reduces the agency's cost burden to taxpayers.

A separate EPA program for fuel economy compliance has also been instrumental in enforcing emission standards. Manufacturers test, subject to EPA confirmation, about 2000 pre-production vehicles annually for fuel economy purposes. Since these vehicles must pass emission standards to be considered to be representative vehicles for the purpose of generating fuel economy data, this provides an additional measure of compliance with criteria pollutants.

Vehicle compliance in India

Vehicle emissions testing in India does not have the extensive track record that it does in the US, but it has developed into a comprehensive system over the years. Enforcing vehicle emissions standards in India falls under the jurisdiction of the Ministry of Road Transport and Highways (MoRTH). The MoRTH has certified six testing

² Fines up to \$37,500 per vehicle under the Mobile Source Civil Penalty Policy (<http://www.epa.gov/compliance/resources/policies/civil/caa/mobile/vehicleengine-penalty-policy.pdf>). In 2008, more than 3 million light-duty vehicles were recalled for engine and/or emissions violations.

agencies that may conduct testing on its behalf. The six agencies are themselves public-private partnerships that receive part of their funding from vehicle manufacturers.

In India, manufacturers first submit a vehicle prototype to a certified testing agency for type approval testing and receive a certificate if the prototype passes—similar to US EPA's pre-production testing requirement. Conformity of production (COP) tests are then conducted for all vehicle models in India—similar to US EPA's SEA testing. Tests are conducted every three months, every six months, or every year, depending on sales of the vehicle model.

Legal guidelines in India specify that COP testing be conducted at random. But while testing agencies do select test samples randomly from a manufacturer's lot, they must give prior notice to manufacturers about the approximate time during which samples will be collected from a given lot³.

In the case that a vehicle model does not pass the initial COP tests, the testing agency sends copies of test reports to the manufacturer and the MoRTH. Over the next four weeks, the manufacturer and the MoRTH work together to find a solution to the problem. If ultimately the MoRTH decides to revoke the type approval certificate for a vehicle, the manufacturer can rectify the manufacturing process and resubmit it for testing. This process can be repeated multiple times. The type approval certificate will only be reissued when a vehicle passes COP testing.

If, after repeated attempts, a vehicle still cannot pass COP procedures, the government has the legal authority to take further action against a manufacturer, such as issuing a recall. This has not happened to date, though, and legal procedures for the MoRTH to issue mandatory recalls or levy fines have not been established.

There are currently no measures in India to test in-use vehicles according to their original emission standards.

Comparing Compliance Programs in India and the US

There are many instances in which vehicle emissions compliance in India has shortcomings compared to the US program.

One area in which there is room for improvement is in the regulatory language specifying that testing agencies inform manufacturers in advance of the approximate time and location for selecting COP samples. This can lead to a situation in which manufacturers fill their lots with a few

vehicles known to be testworthy during that time, while noncompliant vehicles are stored elsewhere⁴. Ideally, the regulatory language in India should allow a testing agency to select any vehicle, anywhere, and at any time, without prior notice to the manufacturer. This would ensure a truly random sample is being selected.

Neighbouring China has taken steps to move in this direction. Like India, it used to issue prior notice to manufacturers before selecting vehicles for COP testing. But China 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.

India can also expand its COP process to be more comprehensive, much like the EPA has done. The current system, even if executed perfectly, still leaves a chance that vehicles pass type approval and COP testing but emit much more in the real world. This was found to be happening in the US in the 1970s, which led to the EPA's SEA and IUVP programs. In India, General Motors' Tavera SUV was recently found to be violating emission standards for many years, even though the vehicle had passed type approval and COP testing⁵.

Expanding testing to include in-use vehicles could assist the current COP process in pinpointing which vehicles and manufacturers are out of compliance. As has been found to be the case in the US, manufacturers go to great lengths to identify and fix problems sooner rather than later to minimize the cost, disruption, and damage to a manufacturer's quality reputation which could be associated with a recall. If in-use testing is successful in incentivizing manufacturers to take on most of the cost burden, as with the EPA's IUVP program, it will relieve a large burden on public coffers.

All-in-all, COP and in-use testing will be successful if they are backed by strong and clear policies regarding fines and mandatory recalls for noncompliant vehicles. Various Indian laws, such as the Environment (Protection) Act and Motor Vehicles Act, give government the authority to establish these. But current policy only authorizes the government to revoke certification for vehicles found to be out of COP compliance. Further guidelines concerning government and manufacturer action to remove noncompliant vehicles from the road are unclear. Establishing

3 Conformity of Production in India. https://www.araaiindia.com/services_certification_COP.asp

4 General Motors was found to having been doing this for eight years. <http://www.autonews.com/apps/pbcs.dll/article?AID=/20130726/OEM02/130729911/gm-fires-top-powertrain-exec-several-employees-over-india-emissions#axzz2aEcfFFft>

5 The Economic Times. *Road Ministry forms panel to look into GM's recall of Tavera*. July 24, 2013. http://articles.economictimes.indiatimes.com/2013-07-24/news/40771755_1_general-motors-india-recall-policy-road-ministry

a clear in-use testing and mandatory recall policy for noncompliant vehicles will incentivize manufacturers to design and build vehicles that comply with emission standards for the duration of their useful life.

Conclusion

There is much India can learn from the US to improve vehicle emissions compliance and enforcement. Establishing a national in-use testing program with fines

and mandatory recalls for noncompliant vehicles will put the onus on manufacturers to ensure their vehicles meet emission standards throughout a vehicle's useful life. This will go a long way in reducing vehicular air pollution in the country.

India's neighbour China is one country that is making headway in this direction. It is revamping its laws and regulatory language to tighten compliance and enforcement, minimize legal loopholes, and reduce opportunities for fraud.