

Solutions to #dieselgate

Fixing Europe's broken system of car testing

September 2015



Summary

The VW #dieselgate scandal and discovery that just 1 in 10 new diesel cars is achieving Euro 6 limits on the road¹ has highlighted the inadequate system of testing cars in Europe. New evidence that the gap between official CO₂ test results and average emissions on the road has grown to 40%² demonstrates this is not a problem limited to one rogue company or just diesel cars but a systemic problem in which carmakers distort tests to circumvent environmental regulations. The VW scandal is the tip of the iceberg regarding ways carmakers manipulate tests. *The national enquires launched in Member States must encompass all vehicle tests, and the European Commission should launch its own investigation into how effectively national regulators have been implementing the type approval system.*

The way cars are tested in Europe is not fit for purpose. Specifically: tests are unrepresentative of the way cars are used and test procedures poorly defined. Tests are performed on specially prepared “golden vehicles” chosen by the manufacturer and significantly different to those sold. Tests are usually conducted in manufacturers own laboratories by testing organisations; these are paid for by the carmakers and overseen by national Type Approval Authorities (TAA). TAAs thus complete for the business of approving vehicles. There are 5 key solutions:

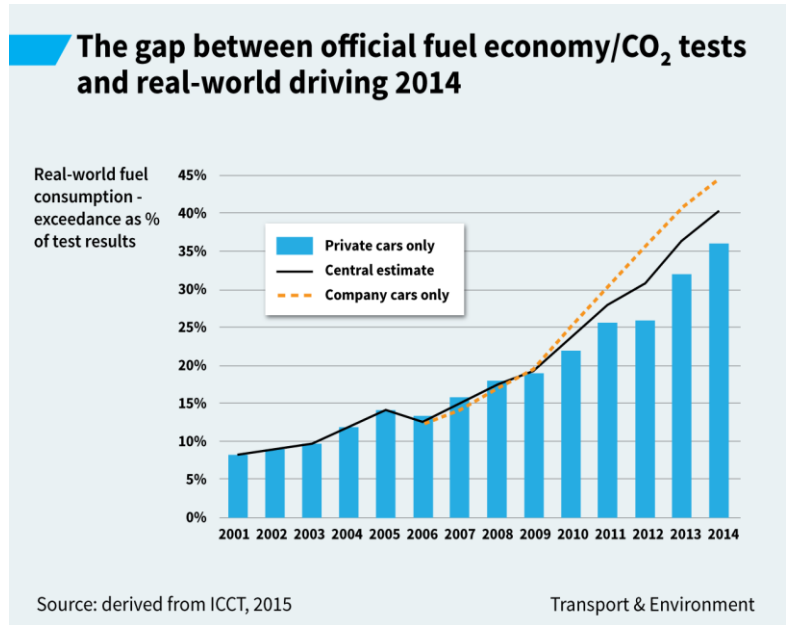
1. The vehicle approval system must be overseen by a European Type Approval Authority to ensure tests are performed consistently and independently. A charge of €20 per new vehicle sold would fund a European body and break the contractual link between the manufacturers and testing organisations
2. New models should be tested on the road to identify suspicious wide disparities between test and real world performance that may indicate the use of defeat devices. Such tests should be conducted for both air pollutants and CO₂ and provide the basis for consumer information and national emissions based taxation schemes
3. The new World Harmonised Light Duty Test Procedure (WLTP) test must be introduced from 2017 for both air pollution and CO₂ and be used as the basis for 2025 car CO₂ standards
4. The new real world driving emission test should be introduced in 2017 and expanded to cover all pollutants
5. The system of testing vehicles through Periodic Technical Inspections must be improved and on road surveillance increased in order to identify and enforce the repair of grossly polluting vehicles.

¹ <http://www.transportenvironment.org/publications/dont-breathe-here-tackling-air-pollution-vehicles>

² <http://www.transportenvironment.org/press/some-mercedes-bmw-and-peugeot-models-consuming-around-50-more-fuel-official-results-new-study>

1. Introduction

The VW #dieselgate scandal and discovery that just 1 in 10 new diesel cars are achieving Euro 6 limits on the road³ has cast a shadow over the way cars are tested in Europe. New evidence that the gap between official CO₂ test results and average emissions on the road has grown to 40%⁴ demonstrates this is not a problem limited to one rogue company or just diesel cars by a ubiquitous problem. VW's illegal use of a "defeat device" for tricking laboratory tests resulted from a European testing system in which carmakers chose to circumvent environmental regulations rather than ensuring they deliver real world benefits. They have done so because systematic weaknesses in the way cars are tested have encouraged and enabled them to do so.



The consequences of manipulating emissions tests are that 20 countries breach ambient air pollution limits and half a million Europeans dying annually from air pollution – many as a result of continuing high vehicle emissions. For CO₂, just a third of the improvement measured in laboratory tests has been delivered on the road since regulations were adopted in 2008 and real world progress stagnated since 2012. By 2030, the growing gap will have cumulatively emitted 1.5bn t of CO₂ from cars, undermining climate goals.

THE VW SCANDAL IS THE TIP OF THE ICEBERG REGARDING WAYS CARMAKERS MANIPULATE TESTS. THE NATIONAL INQUIRES LAUNCHED IN MEMBER STATES TO UNDERSTAND THE SCALE OF THE PROBLEM MUST BE EXTENDED TO COVER ALL VEHICLE TESTS AND THE EUROPEAN COMMISSION SHOULD ALSO INITIATIVE AN INVESTIGATION. THIS SHOULD FOCUS ON HOW EFFECTIVELY NATIONAL REGULATORS HAVE BEEN IMPLEMENTING THE TYPE APPROVAL SYSTEM.

2. Why the EU needs an overseeing regulator

The fact that it was the US that discovered the illegal defeat devices on VW cars is not chance. The US Environmental Protection Agency initiated a detailed investigation after the International Council on Clean Transportation (ICCT) testing demonstrated a huge discrepancy between test and real world performance. The US EPA was tenacious in pursuing VW over more than a year and had the resources and powers to do so. It has also levied punitive fines and can bring cases against company directors. VW was not the first company caught cheating by the US EPA, Hyundai-Kia, Ford, Mercedes and recently BMW-Mini have all been caught fraudulently declaring incorrect fuel efficiency.

The ICCT also made the European Commission and national Type Approval Authorities (TAA) aware when it informed the US authorities about the high NO_x emissions from VW and other vehicles 18 months ago - but

³ <http://www.transportenvironment.org/publications/dont-breathe-here-tackling-air-pollution-vehicles>

⁴ <http://www.transportenvironment.org/press/some-mercedes-bmw-and-peugeot-models-consuming-around-50-more-fuel-official-results-new-study>

in Europe no action was taken. The Commission is responsible for setting regulations but not implementing them. Applying the rules is the responsibility of national type approval authorities (TAA's, most Government Agencies) but these are highly unlikely to initiate such an investigation. National market surveillance authorities that have the responsibility for checking how cars perform on the road lack both the capacity and expertise to take action.

The weakness of the 28 TAA's is one of the key failures in the system. A new vehicle model must undergo a series of tests to ensure it meets EU environmental and safety regulations. These tests are overseen by the TAA that grants approval. Type approval from any of the 28 TAA's enables the car to be sold EU-wide. But the TAA's are effectively in competition for the business of approving the vehicles. Carmakers may use any authority irrespective of where the vehicle is designed, manufactured and built. For example, Luxembourg is a major supplier of these services to carmakers. TAA's are paid for their work and carmakers go "Type Approval Shopping" before agreeing who will perform the service. Separate testing organisations that perform the actual tests, often in the carmakers own laboratories, are also paid by the carmaker. The system lacks genuine impartiality and independence.

Another recent illustration of the ineffective controls occurred in 2013, when Mercedes continued to use an illegal refrigerant in the air conditioning system of its cars despite it being outlawed in the EU. The type approval should have simply been withdrawn by the relevant national TAA, in this case the German KBA. But no such action was taken, and the Commission was powerless to enforce its regulations – it was illustrative of a system in which the rules are not effectively enforced. TAA's do not act for several reasons:

- They are part of national administrations and subject to political influence
- The withdrawal of a type approval would indicate it had failed to do its job properly initially
- It would lose the cooperation and revenue it earns from the carmaker
- Many lack the resources to undertake independent investigations.

The Commission proposed response has been to develop a revision to the type approval regulations. But this is only intended to improve recall and information sharing between TAA's. Such a hopeless remedy to the current crisis is laughable.

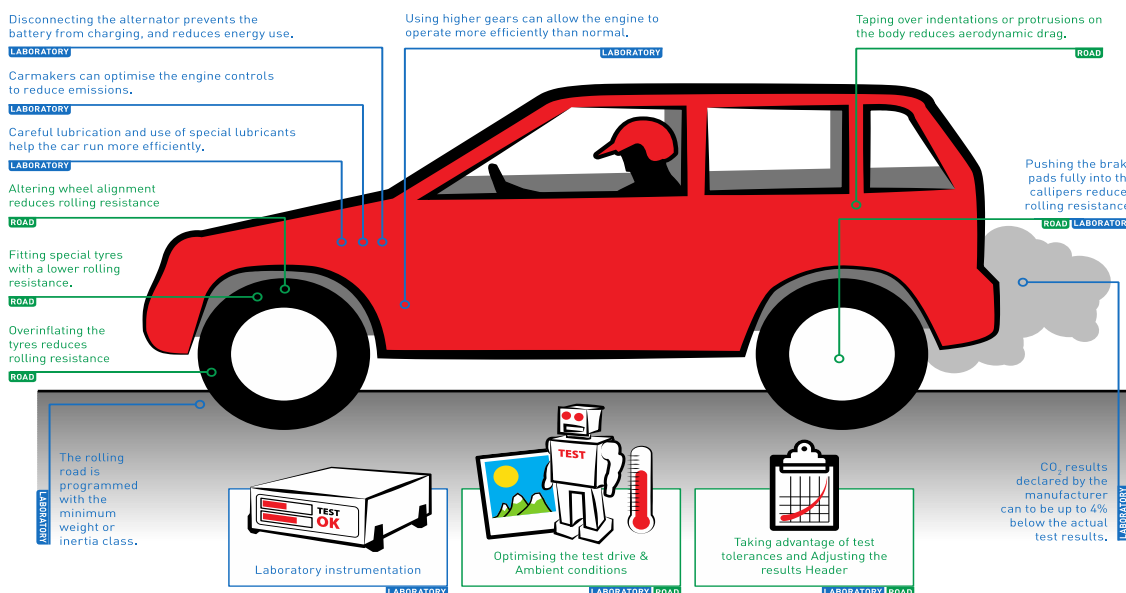
THE SYSTEM OF NATIONAL TAA CANNOT DELIVER THE INDEPENDENCE AND RIGOR REQUIRED TO ENSURE VEHICLES MEET EU REGULATIONS. THE SYSTEM MUST BE OVERSEEN BY A EUROPEAN TYPE APPROVAL AUTHORITY TO ENSURE TESTS ARE PERFORMED CONSISTENTLY AND INDEPENDENTLY. THIS COULD POTENTIALLY BE A PART OF THE PROPOSED EUROPEAN ROADS AGENCY OR LINKED TO THE JOINT RESEARCH CENTRE. BY LEVYING A CHARGE OF €20 PER VEHICLE SOLD THE AUTHORITY COULD BE FUNDED AND THE CONTRACTUAL LINK BETWEEN THE MANUFACTURERS AND TESTING ORGANISATIONS BROKEN.

3. Testing the right vehicles

The US system is also better than that in the EU because the cars that are tested are the same as those bought and used by drivers. In the US, carmakers self-certify that vehicles comply with regulations. The US EPA undertakes its own random retesting programme at its laboratory at Ann Arbor, and also checks the test results on models for which it receives a significant number of complaints from motorists. Overall it has increased the share of audits of manufacturer test results, to the extent that 15-20% of models are now retested by the EPA. The checking and punitive penalties levied by the EPA for incorrect testing actively discourage inaccurate self-certification. The US EPA is still strengthening its system of oversight and plans to issue revised guidelines clarifying how automakers should conduct the testing, and to continue more intensive audits of the carmakers' own tests. The US EPA response is proactive and comprehensive in contrast to the slow and piecemeal progress and proposals in the EU.

In Europe, type approval is conducted on pre-production models. These are specially prepared so-called “Golden Vehicles” carefully configured for the tests. For example, batteries are externally charged before tests; wheels are aligned to minimize rolling resistance; high quality lubricants used; brakes adjusted; aerodynamics improved by removing roof strips and off-side wing mirrors and weight minimized etc. The tested vehicle only bares a loose resemblance to the one coming off a production line.

Common ways carmakers manipulate tests for CO₂ emissions and fuel economy



In Europe, the conformity of production checks performed on manufactured vehicles are minimal, largely paper audits that demonstrate the vehicle is sufficiently similar to that which has been type approved.

STRENGTHENING THE SYSTEM OF CONFORMITY OF PRODUCTION CHECKS TO ENSURE PRODUCTION CARS MATCH EMISSIONS MEASURED DURING TYPE APPROVAL IS NEEDED. ALL NEW MODELS SHOULD BE TESTED ON THE ROAD TO IDENTIFY WIDE DISPARITIES BETWEEN TEST AND REAL WORLD PERFORMANCE THAT IS SUSPICIOUS AND MAY INDICATE THE USE OF A DEFEAT DEVICE DECEIVING THE TESTS.

4. Robust laboratory tests

The current NEDC (New European Drive Cycle) is obsolete and not fit for purpose. First developed in the 1970's it is entirely unrepresentative of the way cars are driven. Vehicles spend a quarter of the 20 minute test stationary and test procedures are inadequately defined allowing multiple loopholes to reduce the measured results – including allowing for a 4% deduction from the final measured value.

A new global testing system (the World Light Duty Test Cycle and Procedures – WLTC/P) has been under development at the United Nations Economic Commission for Europe (UNECE) for many years and will be finalised in Autumn 2015. This test cycle is more representative of real-world driving and the test procedures are more robust when compared to Europe's NEDC.⁵ The European Parliament⁶ and European Commission have proposed this new test be introduced in 2017 and this is essential to prevent carmakers continuing to

⁵ New European Drive Cycle – the current obsolete test

⁶ [http://www.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2012/0190\(COD\)&l=en](http://www.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2012/0190(COD)&l=en)

manipulate the obsolete NEDC procedure.⁷ The WLTP will still not be representative of real world driving, and when it is introduced it is estimated CO₂ emissions will still be around 25% below average real world performance.

THE WLTP TEST MUST BE INTRODUCED FROM 2017 AND USED AS THE BASIS FOR 2025 CAR CO₂ STANDARDS. BUT THE TEST IS STILL NOT REPRESENTATIVE OF REAL WORLD FUEL ECONOMY. TEST RESULTS WILL THEREFORE NEED TO BE ADJUSTED TO PROVIDE ACCURATE CONSUMER INFORMATION.

The WLTP is better than the NEDC system but far from perfect. In particular it is clear that “defeat devices” can easily detect when a car is tested in a laboratory and modify the emissions but very difficult to spot. There needs to be road tests to complement those in the laboratory to identify significant discrepancies.

The transition from NEDC to the WLTP testing system requires the 95g CO₂/km average target for new cars in 2020/21 to be modified because this is based on the NEDC test. The approach proposed by the European Commission to correlate between the NEDC and WLTP tests using a computer simulation tool.⁸ The proposal is that from 2017 CO₂ measurements are conducted using the WLTP test. In addition the simulation tool will derive an NEDC equivalent CO₂ value for each car sold. In 2020 all new cars registered will have both a WLTP measured CO₂ value and simulated NEDC equivalent. From this it will be possible to calculate the average CO₂ emissions for each manufacturer based on both measured and simulated values. The simulated values will be compared to the present company targets to assess compliance with regulation. It will also be possible to derive a WLTP equivalent target for use after 2020 (based on the measured WLTP value and ratio of the NEDC simulated average CO₂ value and the company NEDC target).

How the simulation tool operates fundamentally effects the assessment of compliance with regulations and setting equivalent WLTP-based targets. Which flexibilities in the NEDC procedure are allowed for by the simulation tool will therefore significantly influence the stringency of the regulation. The Commission has committed to ensuring “equivalent stringency” between the current NEDC based targets and new WLTP target but is interpreting this to mean every flexibility in the NEDC test is included in the correlation method and new WLTP-based targets, effectively weakening the regulation. Analysis by the ICCT⁹ and T&E shows legitimate differences between the NEDC and WLTP test cycle and procedures are leading to a 10g/km difference between the two tests. But the Commission and some Member States want to include three unfair abuses of the NEDC test procedure that will increase the average correlation by an additional 10-15g/km thereby weakening the regulation.¹⁰ Including these illegitimate differences in the test would increase the difference between the simulated NEDC and measured WLTP test by a further 10 g/km – effectively weakening the regulation through the back door.

AT PRESENT THERE IS A ROBUST TARGET (95G/KM) AND WEAK TEST (NEDC). WITH THE CORRELATION THERE WILL EFFECTIVELY BE A WEAK TARGET (EQUIVALENT TO 120-124G/KM) AND STRONG TEST (WLTP). THE COMMISSION, MEMBER STATES AND THE EUROPEAN PARLIAMENT NEED TO TAKE A STRONG POSITION ON WHAT LEGITIMATE FLEXIBILITIES ARE FOR THE PURPOSE OF ASSESSING “EQUIVALENT STRINGENCY”. THIS SHOULD BE BASED UPON THE WAYS CARS WERE TESTED IN 2010 WHEN THE CARS CO₂ REGULATION WAS ADOPTED.

5. From testing in the laboratory to measuring air pollution and CO₂ on the road

⁷ ACEA 2013, ACEA views on COM paper “Options for Correlating CO₂ Emission Targets”; WLTP TWG Correlation, 18 December 2013

⁸ European Commission, 2015, DISCUSSION PAPER – NEDC/WLTP CORRELATION METHODOLOGY; Expert Group on CO₂ emissions from light duty vehicles, meeting May 2015.

⁹ <http://www.theicct.org/wltp-how-new-test-procedure-cars-will-affect-fuel-consumption-values-eu>

¹⁰ <http://www.transportenvironment.org/publications/collusion-weaken-fuel-economy-regulations>

Laboratory tests have the benefit of being reproducible but are unrepresentative of the ways cars are driven on the road and susceptible to gaming and manipulation such as through the use of defeat devices that are very difficult to detect.

This led to an important step forward in Euro 6 legislation that the limits should be met in “normal driving.” Real world driving emissions test procedures have been developed and will be implemented from 2016 and limits hopefully enforced from 2017. These real world driving emissions (RDE) tests measure the actual emissions from the exhaust using a portable emissions measurement system (PEMS). Initially the RDE tests will only apply to NO_x from diesel cars and later - particle number emissions from gasoline direct injection vehicles. At present there are no plans to extend the tests to other pollutants or CO₂ / fuel efficiency.

Methodologies to normalize real world test results are available and enable more reproducible test results to be generated from RDE tests. These would make an ideal method to check conformity of production in order to confirm that laboratory test results conducted during the initial type approval have not been unfairly distorted.

REAL WORLD TESTING USING PORTABLE EMISSIONS MEASUREMENT SYSTEMS (PEMS) SHOULD BE USED AS PART OF CONFORMITY OF PRODUCTION CHECKS ON CARS BOUGHT BY CONSUMERS. THE RESULTS SHOULD BE WITHIN A GIVEN MARGIN OF TOLERANCE OF THE LABORATORY TESTS TO DISCOURAGE UNFAIR MANIPULATIONS. TESTS SHOULD CONFIRM BOTH AIR POLLUTION AND CO₂ EMISSIONS.

6. Proper checks on In-use vehicles

Designing tests on production vehicles that are both rigorous and independently-conducted is the only way to ensure that new vehicles' exhaust emissions really are clean and reduce the burden of air pollution. However, there remains a legacy problem with the existing fleet that strengthening the system of periodic technical inspections (PTIs) undertaken in Member States must address. The use of on-board diagnostic systems for checking emissions can create a further loophole. On some cars diesel particulate filters or lean NO_x traps are removed but the software or testing system is unable to detect this. For example, the PTI tests will need to verify that Selective Catalytic Reduction (SCR) and particle filters are functioning correctly throughout the life of the vehicle.

CHECKS ON THE EMISSIONS FROM OLDER VEHICLES NEED TO BE CHECKED MORE EFFECTIVELY AND GROSS POLLUTERS REMOVED FROM THE ROAD.

Further information

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