

This report provides new evidence and understanding on why there is a growing gap between the official fuel consumption and CO<sub>2</sub> emissions of new passenger cars and vans and that which is achieved by the same vehicles on the road. It demonstrates that the current (NEDC) test is outdated and unrepresentative of real-world driving and current vehicles, and that lax testing procedures are allowing car-makers to manipulate the official tests to produce unrealistically low results. The report also shows that the current supervision of testing and checks on production vehicles (to ensure these are equivalent to tested vehicles) are inconsistent and inadequate, with manufacturers paying the organisations undertaking and certifying the tests. The conclusion is that the current system for measuring car and van fuel economy and CO<sub>2</sub> emissions is not fit for purpose and is in need of urgent updating.

### **Why representative, robust fuel economy and CO<sub>2</sub> emissions data from vehicles are essential**

Providing reliable information about the fuel economy of cars helps drivers choose models with lower running costs. Having accurate tests of vehicle carbon dioxide (CO<sub>2</sub>) emissions is essential to enable governments to levy the correct level of vehicle taxes and ensure regulations to reduce emissions from new cars are effective.

All drivers know that it is usually impossible to achieve the official manufacturer fuel efficiency figures, and for some individual models the real-world emissions are now 50% higher than the test results. The gap between official test results and typical real-world driving performance is also growing. In Germany, the gap has increased from 7% on average in 2001 to 23% in 2011 and consequently only half the anticipated improvement in fuel economy (of 1 l/100km) has been achieved on the road. For drivers, this is adding around €2,000 to the fuel costs of the vehicle over its lifetime. Data from Germany is supported by other studies from the Netherlands and Switzerland. The growing gap is leading drivers to become increasingly distrustful of official data on fuel economy, making them less likely to consider buying a more fuel efficient vehicle.

### **Three reasons why the gap is growing**

There is no evidence that the growing gap is caused by changes in the way cars are used and driven. Instead, the evidence shows three principal causes:

1. The current test is unrepresentative of real-world cars and driving. Much of the technology introduced to improve efficiency of cars is far more effective in the test than on the road. For example, technology to switch off the engine when the vehicle is stationary is very effective during the test when the vehicle is stationary for 20% of the cycle.
2. Cars are also increasingly fitted with energy-guzzling accessories like air-conditioning, navigation and media systems, heated-seats, etc. This equipment is not switched on during the test and by omitting the energy consumed, the official test results are lowered.
3. The current (NEDC) test procedures to measure CO<sub>2</sub> and fuel consumption are outdated and lax and contain many loopholes that carmakers are increasingly exploiting to lower the results.

## How carmakers manipulate test procedures

A substantial body of evidence, including a new expert study for the European Commission, shows the many ways car-makers are able to manipulate test results. By creative interpretation of the test procedures car-makers are able to achieve multiple small improvements that lower the test results as illustrated in the Figure.

The results of both parts of the test are manipulated. During the road load part of the test, the air and rolling resistance of the car is measured and the results used during the subsequent laboratory test. In the laboratory test the car is driven on a rolling road through a test cycle comprising of a series of accelerations, steady state driving and decelerations. Fuel economy and CO2 emissions are measured throughout the test. The results of the road load test are used to set the resistance of the rolling road (how difficult it is for the car wheels to turn the rollers).

- The road load test

When the road load test procedures were drafted 30 years ago, no-one expected car-makers to adjust the brakes, pump up the tyres, and tape up all the cracks around the doors and windows to reduce the air and rolling resistance. These practices are now commonplace, with testing facilities being paid to optimise the results of the tests. There is no evidence that carmakers are breaking any formal rules - but they don't need to - the current test procedures are so lax there is ample opportunity to massage the test results.

Testing undertaken by an independent laboratory has found that for older vehicles, road load results in realistic tests – e.g. using regular production vehicles - were on average 19% higher than the results obtained in official tests. For more modern vehicles the average difference was 37%, supporting other evidence that the manipulation of the road load part of the test is increasing. These differences would result in around a 12% reduction in measured fuel economy.

In the US, Hyundai-Kia were found to have not conducted the road load test fairly. Several manufacturers in Europe have been successfully challenged over unfair advertisements using official test results.

- In the laboratory

Results are also being polished up in laboratory tests by, for example, allowing the battery to discharge during the test; minimizing the weight of the car; using special lubricants that are not supplied with the production vehicle and testing in unrealistically hot temperatures. Once the results have been compiled the current procedure also inexplicably allows the CO2 results declared by the manufacturer to be up to 4% below the measured results.

Independent laboratory tests, using the official drive cycle but with regular production vehicles and without using all the loopholes in the rules, show on average 12% higher fuel consumption and CO2 emissions than official figures reported by the car-maker. In total, the independently executed tests lead to 19-28% (average 23%) higher CO2 emissions and fuel consumption than the official figures reported by carmakers. About half of this is explained by differences accruing from the road load testing, the other half comes from differences in the laboratory testing. This is the same level as the average gap between official test figures and real-world fuel consumption observed in Germany.

## Common ways carmakers manipulate tests for CO<sub>2</sub> emissions and fuel economy

Disconnecting the alternator prevents the battery from charging, and reduces energy use.

LABORATORY

Carmakers can optimise the engine controls to reduce emissions.

LABORATORY

Careful lubrication and use of special lubricants help the car run more efficiently.

LABORATORY

Altering wheel alignment reduces rolling resistance

ROAD

Fitting special tyres with a lower rolling resistance.

ROAD

Overinflating the tyres reduces rolling resistance

ROAD

Using higher gears can allow the engine to operate more efficiently than normal.

LABORATORY

Taping over indentations or protrusions on the body reduces aerodynamic drag.

ROAD

Pushing the brake pads fully into the callipers reduces rolling resistance.

LABORATORY

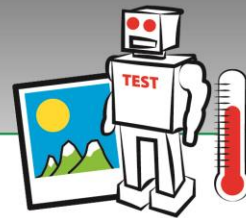
The rolling road is programmed with the minimum weight or inertia class.

LABORATORY



Laboratory instrumentation

LABORATORY



Optimising the test drive & Ambient conditions

LABORATORY ROAD



Taking advantage of test tolerances and Adjusting the results Header

LABORATORY ROAD

CO<sub>2</sub> results declared by the manufacturer can be up to 4% below the actual test results.

LABORATORY

## How much are falling official CO<sub>2</sub> emissions the result of manipulating tests?

The extent to which manipulation of the tests has contributed to the improvement in official CO<sub>2</sub> figures has been estimated by consultants for the European Commission. They conclude around 30% of the net CO<sub>2</sub> emission reduction between 2002 and 2010 does not result from technology deployment and that “utilisation of flexibilities may account for two-fifths to one half of the net CO<sub>2</sub> emission reduction between 2002 and 2010.” From their detailed findings, the causes of the current gap can be estimated to be:

- About 25% due to flexibilities in the laboratory test
- 25% – 35% due to flexibilities in the road load test
- 10-20% due to omissions from the test (like air conditioning systems)
- 10-20% due to the NEDC cycle being unrepresentative
- 10-20% from unknown causes.

## Four key steps to deliver robust fuel economy and CO<sub>2</sub> emission data

There are four key steps to address the current distortion of car fuel economy and CO<sub>2</sub> measurements in official tests and ensure the system is robust and fit for purpose:

1 New rules should be quickly introduced to close the biggest loopholes in the current (NEDC) test procedures. This should be followed by re-testing of all current production vehicles using the revised procedures to ensure official figures are a better reflection of actual CO<sub>2</sub> and fuel economy information. Re-testing should be completed by the end of 2014 to ensure 2015 regulatory targets for new car CO<sub>2</sub> levels cannot be distorted by manipulating test results. In parallel, the European Commission should ensure there is much greater consistency in the way that National Type Approval Authorities and Testing Services undertake and certify official tests and checks on new production vehicles.

2 A new test cycle and testing procedures should be introduced in 2016. The World Light Duty Test Cycle (WLTC) is under development and is expected to be finalised in 2014, providing a modern credible alternative to the current NEDC system. This should be done in a way that ensures the new cycle is representative of typical average driving in the EU and that vehicles are tested under representative conditions, including switching on during the test all equipment such as the lights, air conditioning, etc. The new system should provide much greater transparency on how tests have been undertaken and calculations performed. A parallel system of tests on production vehicles should ensure that there is no deviation between official test results and those achieved in official (type approval) tests. The automotive industry has been pressing for, and developing the new test, but is now arguing it should not be used until 2021! This is in part because the new test cannot be manipulated to the same extent.

3 By 2020, a new system for type approval of vehicles should be introduced to ensure certifying and testing bodies are entirely independent of car-makers. This should include specific consideration of establishing an EU-wide Type Approval Authority that would then sub-contract testing services to accredited national organisations. This is needed because the current supervision of testing and checks on production vehicles (to ensure these are equivalent to tested vehicles) are inconsistent and inadequate, with manufacturers paying the organisations undertaking and certifying the tests, and Europe’s many facilities and type approval authorities competing for business.

4 In order to restore consumer confidence, the car labelling directive should be reviewed on the basis of the US model that communicates the best possible estimate of real-world fuel economy.

## Concluding comments

The system of regulating car-makers to ensure they achieve progressive improvements in fuel economy and CO2 emissions of new cars is, on the whole, effective and well designed. But the existing system for measuring the performance of individual cars is not fit for purpose and needs to be updated. By doing this, drivers will achieve fuel economy similar to official data restoring trust and encouraging the shift to fuel efficient cars.

Currently car-makers are misleading their customers by promoting fuel efficiency figures that they know will not be achieved. Car-makers are also cheating policy-makers by manipulating the official tests and producing vehicles that only achieve regulatory targets during the test - not on the road - where the fuel is burnt and emissions occur. An updated system will ensure vehicle taxes linked to official CO2 data will be more effective in driving the shift to more fuel efficient models. This will support EU regulations requiring cars and vans to become more efficient and less polluting that are currently (2012/3) being considered by the European Parliament and Council. If loopholes are not closed, the environmental and the wider economic benefits of the regulation will be much smaller than would be expected. Specifically, less jobs will be created, the increase in GDP from less oil spending will be lower and oil imports will be higher, worsening balance of payments. Greenhouse emissions will not be reduced as forecast.

The regulatory pressure to reduce new car CO2 emissions and the significant tax breaks on cars with low CO2 test figures are all providing an incentive for car-makers to manipulate official test results. The poor oversight of official tests is allowing this to happen. Evidence indicates the full range of test flexibilities are not yet being exploited and the manipulation of official data will continue to increase, unless policy-makers act and implement the four recommendations detailed above.

## Further information

Further information is available from:

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