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Submissions regarding: Vehicle Exhaust Emissions (2007)
Rule 33001/2

Emission Testing New Zealand (2006) Ltd, AECS Ltd and the YES! Inc. wish to have the following submissions read and considered in conjunction with the draft proposal.

This submission is created by Herbert Leijen and Kevin Hamer on behalf of those parties.

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Overview;

No comments

Draft Rule;

Comments as follows

Section3 Metered test
Table 3.1

In our view the Level of Hydrocarbons (300PPM) is unrealistically high. Even old technology vehicles (carburettor equipped vehicles without catalyst) in average condition can easily achieve an HC level of <200 PPM. A level higher than 250PPM in most instances indicates a serious technical defect (polluting) in a vehicle, reducing its fuel efficiency significantly.
Smog is mainly the result of high levels of HC's combined with NOX and sunlight in the lower atmosphere. It would be counter productive to set the levels of HC as high as in the draft proposal.
A normal mid nineteen nineties vehicle in average condition equipped with working catalytic converter and oxygen sensor in good condition will emit < 50 PPM HC's
The same vehicle with the catalyst removed will emit no more than 150 PPM HC.

Even for in service testing of the current NZ vehicle fleet a tighter standard (e.g. 250 PPM) would be realistic.
It is our view the import restriction for four stroke engines should be at a blanket level of 150 PPM HC at idle and at high idle.

It is our view the level of 1% CO for catalytic equipped vehicles is high.
By experience a normal mid nineteen nineties vehicle with good working oxygen sensor and operational catalytic converter will emit not more than 0.5 % vol CO.
A level higher than 0.5vol % CO indicates a technical problem with the vehicle, or that the catalytic converter has been removed or has been by a misfiring engine, for example.

- In our view the import restriction should not allow levels to exceed 1% vol CO at idle and at high idle.

In our view the test should include a lambda value at high idle.

The Lambda value needs to be between a relaxed 0.95 and 1.05.

The above levels will only allow entry to vehicles with minor and repairable defects.

Section 4 Visible smoke check
4.1 Visible smoke check
4.1.1

ETNZ suggest that the visual inspection clause be removed from the import requirements. A recent study on a large number of "end of life" vehicles by ETNZ indicated that there is no validated relationship between the visual inspection and the actual emission values.
The visual inspection will lead to false fail and false pass results, and is open to individual interpretation.

Part 3 Schedules
Procedure

The test procedure needs to modeled on the proven Euro standard of testing, the two stage idle test.

A) idling of the engine (simulates crawling and traffic jam conditions)
B) high idle (engine speed between 2500 and 3500 RPM at low load) simulated dense urban area traffic conditions.

These two tests probably represent in excess of 95% of all urban motoring conditions for the national fleet and therefore are the most likely operating conditions to contribute to poor air quality and national health issues and concerns.
ETNZ recommend adopting the Euro standard test procedure in New Zealand.

Technically it is known many mid nineteen nineties vehicles arrive here with open loop running conditions when at idle. The emissions are not being corrected by the on board

emission control system, plus in many cases the catalytic converter will not operate at design temperature to actively convert the emission in CO2 and H2O.

Instrumentation - Exhaust emission analyzers:

The emission tester needs to be programmable with a test protocol so as to indicate to the inspector what needs to be done, in respect of engine temperature, RPM and timers for the engine to settle.
Only this will achieve:

1) Objective and recordable test results.
2) Consistent and indisputable test results.

Normal 4 gas analyzers where CO, CO2 and HC are measured with the IR gas bench, and where the O2 is being measured with a galvanic cell are common and available from many equipment supplier and are used world wide in most countries where emissions are legislated.
The 4 gas test allows for a Lambda calculation at high idle (requires CO, CO2, HC and O2 values). The lambda calculation is indicative of the engine's ability to mix the fuel correctly, where the HC and CO values could be lowered with for example an air leak in the exhaust.

The suggested 2 gas analyzers with hydrogen flame ionization are outdated and are only available at premium prices from a few equipment manufacturers who are willing to start building them again upon special request.

Further note:
Calibration requirements for emission testers are only prescribed by the legislative authorities, with regards to intervals and calibration gas concentrations.
No emission tester manufacturer will admit that their machine needs to be calibrated to compensate for inaccuracies and drift that do eventuate over time.
In many countries 12 monthly calibration intervals with gas of a composition of around 3.5% CO, 14% CO2, 2000 PPM HC, with the remainder of N2 is used as standard.

Schedule 2 Procedure, equipment and equipment standards for metered test of diesel vehicles

The process ETNZ suggests has similarities to the Japanese standard testing method.
The Reflection type smoke meter equipment is outdated and will only be produced by some manufacturers upon special request, again at premium prices. It has been outlawed in most European countries, where the light absorption method is now used.
The light absorption method is more accurate, produces repetitive results and is cheaper than the reflection test with filter paper.

The light absorption method produces results in opacity percentage which is recalculated to an absorption coefficient (K value). This absorption value is created to achieve consistent test results with different brands of testing apparatus (varying measurement tube length).
The light absorption method test equipment is available from every equipment manufacturer at relatively low prices.
No maintenance of pump mechanisms is needed in the light absorption equipment, and nor are replacement filters needed.
The equipment measures peak K values of 3 snap accelerations and produces a mean value, unless one of the accelerations has fallen outside the predetermined opacity coefficient or acceleration time band widths.

The trend in advanced European countries is to perform one metered snap acceleration, If the results of that test are 0.5 K below the maximum value the vehicle has passed, and no further accelerations are required.
This as opposed to the in the draft rule suggested 6 accelerations which will take around 1.5 to 2 minutes of non essential fouling of the workshop air and its environs.
The test equipment will indicate to accelerate automatically until the test has been completed, as the machine can be programmed with any country specific (Also NZ) protocol.

ETNZ suggest a blanket maximum value of a relaxed K=4
Any Diesel vehicle with a K value of more than K=4 has been deliberately tuned out side manufacturers specifications or has a mechanical fault making the vehicle inefficient.

Further note:

Actual vehicle emission tests on a petrol and a Diesel vehicle to the Euro standard take no longer than 10 minutes each, including recording of details and connecting equipment.
Cost per test including equipment depreciation costs should not raise the cost of a test above NZ$25 plus GST and ongoing tests may actually be less if included as part of another process such as a WOF inspection.

Other Comments;

The testing procedure and equipment standards are modeled on the European methodology. The European methodology is both a cost effective and efficient method, suppliers of equipment are plentiful and the technology is secure and future proof.
Most vehicles manufactured and imported into New Zealand are built to European standards to a varying degree and (Euro) level.
By only relaxing the limits (compared to Euro limits), but not the methodology a consistent standard can be achieved. This methodology also allows for future tightening of the import and in service limits, when the Pass/Fail rate has been identified.

General Comments

No comment

Yours Sincerely
ETNZ (2006) Ltd

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