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Diesel Tailpipe Emissions & Fuel Efficiency Test
Using The Composite Urban Omission Drive Cycle (CUEDC).

Toyota Landcruiser 80 Diesel
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(CUEDC)

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Using The Composite Urban Emission Drive Cycle

1. INTRODUCTION

The following report details the results achieved when a Toyota Landcruiser 80 vehicle was run through a single comparative test program utilizing the Composite Urban Emission Drive Cycle (CUEDC) for category NA vehicles, by Vipac Engineers and Scientists Vehicle Emission Test facility at Altona T4009.

2. PROCEDURES

The testing was carried out in accordance with the Composite Urban Emission Drive Cycle (CUEDC) drive cycle for NA class vehicles (vehicles with a GVM <4.5 tonnes). The CUEDC series of drive cycles were developed from data collected during actual driving conditions around Sydney, and take the form of a single drive-cycle (1794 seconds) broken up into four distinct phases; Congested, Residential / Minor, Arterial, Freeway / Highway. The two tests were driven by Mr. Bill Sheather (Fitch Fuel Catalyst Australia Pty. Ltd.), and were run using regular pump grade diesel fuel as agreed between Vipac Engineers and Scientists and the customer.
Calibrated Hydrocarbon (FID), Carbon Monoxide (NDIR), Carbon Dioxide (NDIR) and Oxides of Nitrogen (Chemuluminescence) gas analyzers were used to determine gaseous emission levels, and a NOVA 'Microtrol 4' diesel particulate measurement unit was used to capture Particulate Matter.
A dilute gas sample was collected via a heated sample line to determine the gaseous emission levels of Total Hydrocarbons and Oxides of Nitrogen. Dilute samples of

Carbon Monoxide and Carbon Dioxide were collected via a Constant Volume Sampler, with ambient and sample bags being analyzed to determine the levels of pollutant. A partial dilution tunnel (the Microtrol 4) was used to capture the emissions of Particulate Matter, the filter papers housed within the unit being weighed prior to, and after each test to determine the mass emissions of Particulates.
The Inertia (Road Load Setting) of the dynamometer was carried out in line with the methods and criteria laid out within the directive UN/ECE R-83, (Uniform Provisions Concerning The Approval Of Vehicles With Regard To The Emission Of Pollutants According To Engine Fuel Requirements). This test is the current certification test used in Europe and Australia for light-duty diesel engine vehicles (equivalent to Australian Design Rule ADR 70/00), applicable to vehicles with a GVM <4.5 tonnes and is carried out on an inertia simulation dynamometer, replicating wind and road loads.
The first of the two tests run over the CUEDC schedule was undertaken with the vehicle in standard showroom condition. This was followed immediately by a second comparative test with the "Fitch Fuel Catalyst" installed between the fuel filter and injector pump. The results of this comparative test can be observed in tables 3.2.1 - 3.2.3 of this report.

3. RESULTS

3.1 TEST VEHICLE DETAILS

MANUFACTURER	TOYOTA JAPAN
MAKE	TOYOTA
MODEL	LANDCRUISER 80
ODOMETER	300000 Km
BUILD DATE	Not Applicable
ENGINE NO.	Not Applicable
VIN NUMBER	Not Applicable
ENGINE TYPE	COMPRESSION IGNITION
ENGINE CONFIGURATION	4.2Litre, 6 CYLINDER I/L OHC
FUEL TANK CAPACITY	95 Liters
TRANSMISSION	5 SPEED MANUAL SELECTABLE REAR OR ALL-WHEEL DRIVE
REFERENCE MASS	2280 kg

EQUIVALENT INERTIA	2270 kg
ROAD LOAD @ 80 kph	11.7kW

3.2 TEST RESULTS

COMPOSITE URBAN EMISSION DRIVE CYCLE CLASS NA VEHICLE (GVM <4.5 Tonnes)	
STANDARD SHOWROOM CONDITION	12.52 L/100km
FOLLOWING INSTALLATION OF FITCH	11.14 L/100km

COMPOSITE URBAN EMISSION DRIVE CYCLE CLASS NA VEHICLE (GVM <4.5 Tonnes)	
OXIDES OF NITROGEN (NOx)	2.42
PARTICULATE MATTER (PM)	0.17
TOTAL HYDROCARBONS (THC)	0.22
CARBON MONOXIDE (CO)	0.64
CARBON DIOXIDE (CO2)	321.35

TABLE 3.2.2 A AVERAGE TAILPIPE EMISSION TEST RESULTS GRAMS/KM STANDARD VEHICLE

COMPOSITE URBAN EMISSION DRIVE CYCLE CLASS NA VEHICLE (GVM <4.5 Tonnes)	
OXIDES OF NITROGEN (NOx)	2.10
PARTICULATE MATTER (PM)	0.14
TOTAL HYDROCARBONS (THC)	0.20
CARBON MONOXIDE (CO)	0.53
CARBON DIOXIDE (CO2)	286.15

TABLE 3.2.3: AVERAGE TAILPIPE EMISSION TEST RESULTS GRAMS/km FITCH FUEL CATALYST INSTALLED

4. CONCLUSION

From the results detailed within section 3.2 of this report, it can be noted from tables 3.2.2. & 3.2.3, that following the installation of the "Fitch Fuel Catalyst", there was a reduction in the Average Tailpipe Emissions of the gasses currently legislated against within vehicle type approval and certification tests undertaken throughout the developed world.

The major concern with compression ignition engine vehicles at present is finding a solution to the high levels of Oxides Of Nitrogen and Particulate Matter emitted by such vehicles. The installation of the "Fitch Fuel Catalyst" reduced Oxides Of Nitrogen by 13%, and Particulate Matter by 18%. There was also a reduction in the levels of Total Hydrocarbons (THC) 9%, Carbon Monoxide (CO) 17% and Carbon Dioxide (CO2) 11%.

Fuel efficiency was also enhanced following the installation of the "Fitch Fuel Catalyst", primarily due to the reduction in the emitted levels of the "Greenhouse Gas" Carbon Dioxide (CO2). An 11% decrease in fuel consumption was achieved over the CUEDC test cycle with the "Fitch Fuel Catalyst" installed.

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