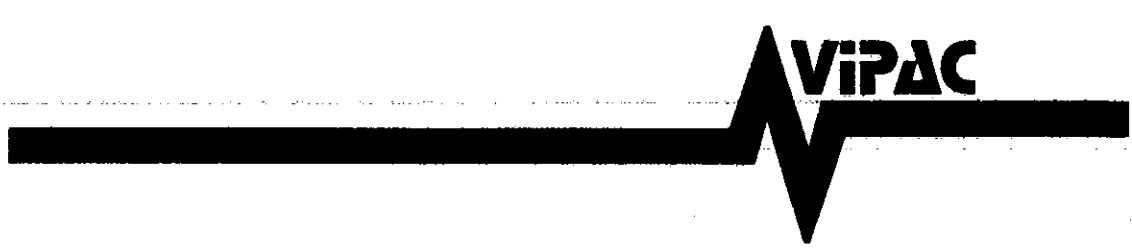
Lovato Autogas Pty Ltd.

Australian Design Rule 79/00

Nissan Patrol (ZD30)

Report No: 30V-09-0131-TRP-460510-0

Vipac Engineers & Scientists Ltd
Melbourne, Australia
Approved Research Organisation (ARO.0125)
DOT. 4009.



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1. INTRODUCTION

The following report details the results achieved when a Nissan Patrol, VIN Number JN1TESY61A0387441, was tested in accordance with Australian design Rule 79/00, as detailed in the Australian Design Rule, by Vipac Engineers and Scientists Vehicle Emissions Test facility at Port Melbourne during the period $16^{th} - 17^{th}$ June 2009.

The testing was conducted in order to verify the conformance of an aftermarket Liquefied Petroleum Gas Vapour Injection Kit (LPG over Diesel), Part Number "DGA (Diesel Gas Australia) Gen IV Nissan Patrol ZD30 System" manufactured & installed by the client.

The kit as installed contained the following major components:

- DGA Electronic Control Unit With Appropriate ZD30 Tuning File.
- Lovato regulator, fuel filter and injector.
- Manchester LPG tank & standard delivery system

2. PROCEDURES

The testing was carried out in accordance with the procedures listed in Australian Design Rule 79/00, Emission Control For Light Vehicles. The vehicle was tested using an equivalent inertia figure of 2270Kg, with a road load power absorption figure at 80km/h of 12.22kW utilising the factors outlined within the table of paragraph 3.2.1 Annex 4 – Appendix 2 with respect to an N1 (III) vehicle type.

Pre-conditioning was undertaken prior to all three tests as per clause 5.3.1 of ADR79/00 with the vehicle being driven over three "Extra Urban" drive cycles prior to being soaked overnight under ambient conditions of between 20°C - 30°C. Oil and coolant temperatures were checked prior to the commencement of the single Type 1 test in order to verify that these parameters were each within 2°C of the current ambient air temperature.

The fuels used for the exhaust emission test were commercially available Ultra Low Sulphur Diesel fuel and commercially available Liquefied Petroleum Gas.

3. TEST VEHICLE SPECIFICATIONS

MANUFACTURER	Nissan.
MODEL	Patrol.
ODOMETER	75960Km.
BUILD DATE	2006.
VIN NUMBER	JN1TESY61A0387441.
ENGINE NUMBER	ZD30-064770K.
ENGINE MODEL & TYPE	Nissan ZD30, 2.953Litre, 4 -Cyl I/L, Direct Injection Compression Ignition.
TRANSMISSION	Automatic.
TYRE SIZES	265/70 R-16 (Front & Rear).
TYRE PRESSURE	220kPa (driven wheels under test).
KERB MASS (Manufacturers Spec)	2420Kg.
REFERENCE MASS	2520Kg.
EQUIVALENT INERTIA	2270Kg.
ROAD LOAD @ 80 kph	12.22kW.

4. TEST RESULTS

AUSTRALIAN DESIGN RULE ADR 79/00 (AVERAGE TAILPIPE EMISSIONS)		
	SPECIFIED grams/km	***MEASURED grams/km***
Carbon Monoxide (CO)	***1.50***	***0.37***
Total Hydrocarbons (THC)	***-N/A-***	***0.05***
Oxides Of Nitrogen (NOx)	***-N/A-***	***0.96***
Total Hydrocarbons (THC) & Oxides Of Nitrogen (NOx) (Combined)	***1.20***	***1.01***
Particulate Matter (PM10)	***0.17***	***0.04***

TABLE 4.1: ADR 79/00 Average Tailpipe Emission Test Results 17/06/09
Nissan Patrol Vin No: JN1TESY61A0387441

5. CONCLUSION

The Exhaust Emission test results of the vehicle when tested in accordance with the Type 1 Test (Average Tailpipe Emissions) procedures incorporated within directive ADR79/00 were within the limits specified for Carbon Monoxide (CO), Total Hydrocarbons (THC) & Oxides Of Nitrogen (NOx) (combined) and Particulate Matter (PM10) for an N1 vehicle of reference mass >1760Kg & GVW >2,500Kg. The published results do not include the relevant Deterioration Factors utilised in lieu of the Type V Test (Durability Of Anti-Pollution Devices).

The vehicle as presented complies with the limits and criteria for an N1 (III) class vehicle (Type I Test) as specified within ADR79/00.

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6. INSTRUMENTATION & CALIBRATION

Carbon Monoxide (CO) Analyser

Make & Model:- Signal Instruments 7100FM

Principal Of Operation:- Infrared

Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)

Last Calibrated May 2009

Total Hydrocarbon (THC) Analyser

Make & Model:- Signal Instruments 3000HM

Principal Of Operation:- Flame Ionisation (FID)

Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)

Last Calibrated May 2009

Oxides Of Nitrogen (NOx) Analyser

Make & Model:- Signal Instruments 4000VM

Principal Of Operation:- Chemiluminescence

Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)

Last Calibrated May 2009

Carbon Dioxide (CO_2) Analyser

Make & Model:- Signal Instruments 7200FM

Principal Of Operation:- Infrared

Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)

Last Calibrated May 2009

Particulate Matter Capture

Make & Model:- Vipac Primary Dilution Tunnel Incorporating

Nova Microtrol 4 Secondary Dilution Tunnel (Mini-Dilution Tunnel)

Principal Of Operation:- Primary & Secondary Dilution Of Sample

Last Calibrated: Flow Calibration Prior To Testing

Particulate Matter Mass Determination

Mettler Toledo Microbalance model XU6

Resolution:- 0.0001mg

Last Calibrated:- February 2009

Constant Volume Sampling System

Make & Model:- Beckman Industries (Critical Flow Venturi)

Method Of Calibration:- Laminar Flow Element

Accuracy:- Standard Deviation Of Calibration Coefficient <0.3%

Last Calibrated August 2008

Total System Verification

Make & Model:- Beckman Industries

Method Of Calibration:- Propane Injection (Using CFO)

System Efficiency:- >95%

Last Calibrated August 2008

Inertia Simulation Dynamometer

Make & Model:- Cirrus Technologies

Calibrated prior to testing:- June 16th 2009

Method Of Calibration/Check:- Vehicle Coast-down @ 2270Kg Inertia (RLP 12.22kW)