VIPAC

Test Report

Lovato Autogas Pty Ltd

ADR79/00

SsangYong Musso

Vipac Reference: 30V-09-0291 -TRP- 445266-0-draft
22 Oct 2009

Vipac Engineers & Scientists Ltd
Melbourne, Australia

DOCUMENT CONTROL

REFERENCE:

30V-09-02-TRP- 445266-0-DRAFT

PREPARED FOR:

Lovato Autogas Pty Ltd
15 McInnis Street
Ridleyton
SA 5008
Contact: Gary Blucher
t. +61 8 8340 2366
f. +61 8 8340 3266

PREPARED BY:

Vipac Engineers & Scientists Ltd
279 Normanby Road
Port Melbourne
VIC 3207, Australia
w. www.vipac.com.au
t. +61 3 9647 9700
f. +61 3 9646 4370

AUTHOR:

Robyn Davies R. A. Davies. Date: 13/11/2009
Project Engineer, Automotive & Defence Group E-mail: robynd@vipac.com.au

APPROVED:

Maurizio Demontis Maurizio Demontis Date: 13/11/2009
Team Leader, Automotive & Defence Group E-mail: mauriziod@vipac.com.au

REVISION HISTORY:

Revision No.	Date Issued	Reason/Comments
0	October 2009	Initial Issue

DISTRIBUTION:

Copy No. 1	Revision No.	Location
1	0	Client
2	0	Project File

KEYWORDS:

TABLE OF CONTENTS

1. INTRODUCTION

The following report details the results achieved when a SsangYong Musso, VIN Number KPAWA2ED54P384482, 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 20th – 21st September 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) Ssangyong Musso System" manufactured & installed by the client.

The kit as installed contained the following major components:

- DGA Electronic Control Unit With Appropriate Ssangyong Tuning File.
- LPG regulator, filter and delivery system.
- Manchester/Elko LPG tank & standard delivery system.

2. TEST PROCEDURE

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 1930Kg, with a road load power absorption figure at 80km/h of 10.92kW 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 the vehicle 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	Ssangyong.
MODEL	Musso.
ODOMETER	86886Km.
BUILD DATE	2004.
VIN NUMBER	KPAWA2ED54P384482.
ENGINE NUMBER	66292012131678.
ENGINE MODEL & TYPE	2.900 Litre, 5 -Cyl I/L, Compression Ignition Turbocharged & Intercooled.
TRANSMISSION	4spd Automatic.
TYRE SIZES	255/65 R-16 (Front & Rear).
TYRE PRESSURE	210kPa (driven wheels under test).
KERB MASS	1870Kg.
REFERENCE MASS	1970Kg.
EQUIVALENT INERTIA	1930Kg.
ROAD LOAD @ 80 kph	10.92kW.

4. TEST RESULTS

AUSTRALIAN DESIGN RULE ADR 79/00 (AVERAGE TAILPIPE EMISSIONS)		
	SPECIFIED grams/km	***MEASURED grams/km***
Carbon Monoxide (CO)	***1.50***	***0.49***
Total Hydrocarbons (THC)	***-N/A-***	***0.05***
Oxides Of Nitrogen (NOx)	***-N/A-***	***0.56***
Total Hydrocarbons (THC) & Oxides Of Nitrogen (NOx) (Combined)	***1.20***	***0.61***
Particulate Matter (PM10)	***0.17***	***0.15***

TABLE 4.1: ADR 79/00 Average Tailpipe Emission Test Results 21/10/09
Ssangyong Musso Vin No: KPAWA2ED54P384482

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.

Prepared By:

R.A. Davies.

Robyn.A.Davies. IEng MSOE MIRTE LCGI

Automotive Engineer – Emissions/Vehicle Certification

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 September 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 September 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 September 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 September 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:- October 20th 2009

Method Of Calibration/Check:- Vehicle Coast-down @ 1930Kg Inertia (RLP 10.92kW)


VIPAC