Emission Testing Conducted on Nissan Cargo Van
by
Japanese Ministry of Transportation
Vehicle Inspection Association

Overview

Test was conducted to evaluate the effects of the AirDog® Fuel Preporator on the exhaust emissions of a 2004 Nissan Cargo Van. This vehicle had been taken out of service due to not being able to meet the exhaust emission standards.

With the installation of the AirDog® Fuel Preporator®, all of the target exhaust emission levels were surpassed.

Exhaust Gas Component	Target Quantity of Emissions	Actual Emissions with Fuel Preporator®	g/km Below Target	% Below Target
CO	3.46 g/km	0.599 g/km	2.861 g/km	82.7%
HC	0.63 g/km	0.076 g/km	0.554 g/km	87.9%
NOx	1.75 g/km	1.206 g/km	0.544 g/km	31.1%
Total DPM*	0.07 g/km	0.064 g/km	0.006 g/km	8.57%

*Diesel Particulate Matter

Date: 2004/12/05 weather: fair

Tested by Japan Vehicle Inspection Association

Details of a testing automobile

Car's name: Nissan Type: U-SP2F23

Vehicle number: P2F23-012229 Application: Cargo

Kilometrage: 49 km

Weight of vehicle: 1530 kg

Gross vehicle mass: 2695 kg

Weight of testing automobile: 1920 kg

Equivalent inertia weight: 1750 kg

Motor type: TD27 Rating: 85/4300 kw/rpm

Cycle: 4 Cylinder: 4 Total Emission: 2.663 L

Transmission: Automatic Forward: 4 steps

Speed reducing ratio: 3.700

Fuel: Diesel oil Ratio: - (Temperature: - ℃)

Tire air pressure at driving (standard): 417 kPa

Tire air pressure at driving (actual measurement): 441 kPa

Test equipment

Chassis dynamo meter: (Banzai Co., Ltd) BCD1100E-DC

Air blower (car speed proportional type): (Banzai Co., Ltd) ECF-850

Exhaust gas and particulate measuring equipment

Exhaust gas analyzer: (Best Locater Co., Ltd) Bex-5200DGS

CVS device: (Best Locater Co., Ltd) C.Bex-030CX-TWG (gathered quantity: 8.6 m³/min)

Dilution tunnel: (Best Locater Co., Ltd) LDD-310W Precision balance: (Zaltrius Co., Ltd) M5P-F

Filter soak record

Soak time before testing: 69 hours (17:00, 17th – 14:00, 20th)

Soak time after testing: 19 hours (14:00, 20th – 09:30, 21st)

Room temperature of capacity of impact testing machine: Max 25.2 ℃ - Min 25.0 ℃

Room humidity of capacity of impact testing machine: Max 61 % - Min 54 %

Results of testing diesel engine automobile exhaust gas (10-15 mode)

Details of testing automobile

Car's manufacturer: Nissan	Type: U-SP2F23	Motor type: TD27	Rating: 85/4300 kw/rpm
VIN: P2F23-012229	Application: Cargo	Cycle: 4 Cylinder: 4	Total Emission: 2.663 L
Mileage:	49 km	Transmission: Automatic	Forward: 4 Steps
Weight of vehicle:	1530 Kg	Speed reducing ratio:	3.700
Gross vehicle mass:	2695 Kg	Fuel: Diesel Oil	
Weight of testing automobile:	1920 Kg	Tire air pressure at driving (standard):	417 kPa
Equivalent Inertia weight:	1750 Kg	Tire air pressure at driving (actual):	441 KPa

Test equipment

Chassis dynamo meter (Banzal Co., Ltd) BCD1100E-DC

Air blower (car speed proportional type): (Banzal Co., Ltd) ECF-850

Exhaust gas and particulate measuring equipment

Exhaust gas analyzer: (Best Locater Co. Ltd) Bex-5200DGS

CVS device: (Best Locater Co. Ltd) Bex-030-CX-TWG (gathered quantity: 8.6 m^3/min)

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Filter soak record

Soak time before testing: 69 hours (17:00, 17th – 14:00, 20th)

Soak time after testing: 19 hours (14:00, 20th – 9:30, 21st)

Room temperature of capacity of impact testing machine: Max 25.2 ℃

Room humidity of capacity of impact testing machine: Max 61% - Min 54%

10-15 mode exhaust gas test

Start: 13:00 Finish: 14:22		Atmospheric pressure:	102.4 kpa
Dry bulb temp. of testing room:	23.8 ℃, after 23.8 ℃	Relative humidity:	38.8 %
Wet bulb temp. of testing room:	15.2 ℃, after 15.2 ℃	KH (NO_x humidity correction factor)	0.937
Dilution ratio (DF):	20.489	Quantity of diluted exhaust gas	22845 L/km
Open mouth pressure difference:	-------- kPa (70km/h)		

Exhaust gas

Component	Density of diluted exhaust gas (A)	Density of diluted air (B)	Net density A-[B*(1-1/DF)]	Target quantity of emissions	Actual emissions with Fuel Preporator
CO (NDIR)	22.90 ppm	0.50 ppm	22.42 ppm	3.46 g/km	0.599 g/km
HC (HFID)	8.35 ppmC	2.69 ppmC	5.79 ppmC	0.63 g/km	0.076 g/km
NOx (CLD)	29.70 ppm	0.21 ppm	29.50 ppm	1.75 g/km	1.206 g/km
CO_2 (NDIR)	0.65 %	0.04 %	0.61 %		

Particulate

Collection efficiency of PM (η): 94.2%

Correction against collected quantity of PM:

Changes of quantity of correction filter 5 μg Ratio against bare minimum of collected quantity: 0.4 %

Collected quantity PMp	Sample flow Vp	Density A=PMp/Vp	Collected quantity PMb	Sample flow Vb	Density B=PMb/Vb	Net density A-[B*(1-1/DF)]
2116 μg	663 L	3.1916 μg/L	21 μg	659 L	.00319 μg/L	3.1312 μg/L
Total DPM* allowed: 0.07 g/km			Total DPM* with Fuel Preporator: 0.064 g/km			

*Diesel Particulate Matter

10-15 mode-run exhaust gas test

Start: 13:00 Finish: 14:22

Dry-bulb temperature of testing room: before start 23.8 ℃ - after finish 23.8 ℃

Wet-bulb temperature of testing room: before start 15.2 ℃ - after finish 15.2 ℃

Dilution ratio (DF): 20.489

Open mouth (air release pipe) pressure difference: - kPa (70km/h)

Atmosphere pressure of testing room: 102.4 kPa

Relative humidity of testing room: 38.8 %

KH (NOx humidity correction factor): 0.937

Quantity of diluted exhaust gas (Vmix): 22845 L/km

Exhaust gas

Component	Density of diluted exhaust gas A	Density of diluted air B	Net density A-[B*(1-1/DF)]	Quantiy of emissions
CO(NDIR)	22.90 ppm	0.50 ppm	22.42 ppm	0.599 g/km
HC(HFID)	8.35 ppmC	2.69 ppmC	5.79 ppmC	0.076 g/km
Nox(CLD)	29.70 ppm	0.21 ppm	29.50 ppm	1.206 g/km
CO_2(NDIR)	0.65%	0.04%	0.61%	253.4 g/km

Particulate

Collection efficiency of PM (η): 94.2 %

Correction against collected quantity of PM:

Changes of quantity of correction filter: 5 μg

Ratio against bare minimum of collected quantity: 0.4 %

Quantity of diluted exhaust gas			Diluted air			Net density
Collected quantity PMp	Sample flow Vp	Density A=PMp/VP	Collected quantity PMb	Sample flow Vb	Density B=PMb/Vb	A-B(1-1DF)
2116 μg	663 L	3.1916 μg/L	21 μg	659 L	0.00319 μg/L	3.1312 μg/L
					Emissions	0.064 g/km

Remarks Regular no-load rotational speed (N): 700 rpm Injection timing: 3(?) BTDC

Co (and the stuff) divergence prevention device	Kind (Quantity)	Oxidation catalyst	Three way catalyst	EGR	L PREPORA			
		(-)	(-)	(-)	1	(-)	(-)	(-)
		(-)	(-)	(-)		(-)	(-)	(-)