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EVALUATION OF FPC-1® FUEL PERFORMANCE CATALYST

AT

GUJARAT STATE ROAD TRANSPORT CORPORATION, AMBAJI TERMINAL

Report Prepared by

UHI CORPORATION
PROVO, UTAH,

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INTRODUCTION

FPC-1® is a combustion catalyst which, when added to liquid hydrocarbon fuels, improves the combustion reaction resulting in increased engine efficiency and reduced fuel consumption. The products of incomplete combustion are also positively affected.

Field and laboratory tests alike indicate a potential to reduce fuel consumption in diesel fleets in the range of 5% to 10%. Smoke and carbon monoxide emissions are typically reduced 15 to 30%. This report summarizes the results of controlled back-to-back field tests conducted by UHI Corporation and Gujarat State Road Transportation Corporation (GSRTC) engineers, with and without FPC-1® added to the diesel fuel. The fuel consumption determination procedure applied was the Carbon Balance Exhaust Emission Test at a given engine load and speed. This same method also measures the exhaust concentrations of carbon monoxide and unburned hydrocarbons. Smoke testing was also conducted using the Bacharach Smokemeter method.

ENGINES TESTED

1 x 370 Viking
5 x Hinos
2 x 665 Leylands

TEST INSTRUMENTS:

The equipment and instruments involved in the carbon balance test program were:

Sun Electric SGA-9000 non-dispersive, infrared analyzer (NDIR) for measuring the exhaust gas constituents, HC (unburned hydrocarbons as hexane gas), CO, CO_2, and O_2.

Scott Specialty BAR 90 calibration gases for SGA-9000 internal calibration of the SGA-9000.

A Fluke Model 51 type "k" thermometer and wet/dry probe for measuring exhaust, fuel, and ambient temperature.

A Dwyer magnehelic and pitot tube for exhaust pressure differential measurement and exhaust air flow determination (CFM).

Monarch Phototachometer and magnetic tape to determine and control engine speed (rpm).

A Bacharach True-Spot smokespot meter to determine the density of exhaust smoke from diesel engines.

A hydrometer and flask for fuel specific gravity (density) measurement.

A Hewlett Packard Model 42S programmable calculator for the calculation of the engine performance factors.

A Snap On throttle control for setting and holding engine speed at a fixed rpm.

TEST PROCEDURE

Carbon Balance

The carbon balance technique for determining changes in fuel consumption has been recognized by the US Environment Protection Agency (EPA) since 1973 and is central to the EPA-Federal Test Procedures (FTP) and Highway Fuel Economy Test (HFET). The method relies upon the measurement of vehicle exhaust emissions to determine fuel consumption rather than direct measurement (volumetric or gravimetric) of fuel consumption.

The application of the carbon balance test method utilized in this study involves the measurement of exhaust gases of a stationary vehicle under steady-state engine conditions. The method produces a value of engine fuel consumption with FPC-1® relative to a baseline value established with the same vehicle.
Engine speed and load are duplicated from test to test, and measurements of carbon containing exhaust gases (CO_2, CO, HC), oxygen (O_2), exhaust and ambient temperature, and exhaust and ambient pressure are made. A minimum of five readings are taken for each of the above parameters after engine stabilization has taken place (rpm, and exhaust, oil, and water temperature have stabilized). The technical approach to the carbon balance method is detailed in the Appendices.

Fuel specific gravity or density is measured enabling corrections to be made to the final engine performance factors based upon the energy content of the fuel reaching the injectors.

Smoke density was determined by drawing a fixed quantity of exhaust gases through a filter medium. The particulate's were collected onto the filter surface and the density determined by comparing the discoloration of the filter paper to a color calibrated scale.

Eight buses made up the final test fleet. Table 1 below summarizes the percent change in fuel consumption.

Table 1:
Summary of Carbon Balance Fuel Consumption Changes

Bus #	Engine	Base RPM	FPC-1 RPM	% Change Fuel Consumption
3125	665 Leyland	2010	2015	- 12.37
3029	370 Viking	2016	2019	- 3.90
2263	Hino	2020	1978	- 10.58
657	Hino	2019	2034	- 5.29
1805	Hino	2011	2010	- 4.19
1804	Hino	2024	2019	- 5.43
1955	Hino	2002	2015	- 4.15
*2750	665 Leyland	2022	2024	- 25.47

*** Replaced head gasket between baseline and treated tests.**

DISCUSSION

1. Fuel Density

High speed diesel was taken from the underground bulk tank to determine the fuel density (fuel specific gravity) for the baseline and treated fuel test segments. The fuel specific gravity for the the treated test segment was 1.1% lower (0.833 vs 0.824) than the baseline fuel specific gravity, therefore, a correction factor of 1.01 is shown on the computer printouts showing the calculation of the FPC-1 treated fuel performance factors (or mass flow rates). The correction factor adjusts the energy content of the treated fuel to that of the baseline fuel.

2. The Effect of FPC-1 upon Smoke Density

Smoke density was determined using the Bacharach smoke spot method. The Bacharach True-Spot Smokemeter measures smoke density by drawing a specific volume of exhaust gas through a fine paper filter medium (5 micron) while the engine is operating at a fixed rpm and under steady-state engine conditions. The smoke particles are trapped on the surface of the filter paper as the exhaust gases are drawn through it forming a darkened area called a "smoke spot". The filter paper is then removed from the smoke tester and the smoke spot visually compared to a precoded smoke scale. A smoke number is then assigned to the smoke spot according to the darkness of the spot. The smoke number scale ranges from 0 to 9. Higher smoke numbers correspond to darker smoke spots, which correspond to a greater smoke density in the exhaust. The baseline and treated fuel smoke spot numbers are tabled below.

Table 2:
Comparison of Smoke Spot Numbers (SS#)

Bus #	Base SS#	Treated SS#	% Change
3125	3.0	2.0	- 33
*1806			
1805	4.0	2.5	- 37
*2750			
657	4.5	3.0	- 33
3029	3.5	2.0	- 43
2263	4.0	4.5	+12
1955	4.0	2.7	- 32

*** Possible anomalies (see Discussion Number 3.)**

A reduction in smoke is prime evidence of improved combustion (Germane, SAE Technical Paper # 831204). Further, reduced exhaust smoking has been shown to be one of first evidences that

engine carbon residue and soot blowby into the motor oil are also being reduced (ibid). The reductions in exhaust smoke are logical extensions of improved combustion created by FPC-1.

3. Possible Anomalies

While conducting the treated fuel carbon balance test, the smoke number was not taken on Unit No. 1806. Once this error was discovered, a UHI technician and Gujarat mechanic found the bus and ran the engine up to full throttle, then took the smoke spot number. This was a much higher rpm and throttle position than that of the baseline smoke spot test, and the rubber hosing attached during the baseline and all other treated fuel smoke tests had been removed, therefore, the comparison is not valid.

Bus No. 2750 had a head gasket replaced between the baseline and treated fuel test segments. A repair of this nature could effect engine performance and engine smoking, and likely did so as Bus No. 2750 showed an improbable fuel consumption reduction during the FPC-1 treated test.

CONCLUSIONS

1) With the anomalies removed from the sample, the fuel consumption change determined by the carbon balance method ranged from - 3.90 to - 12.37%. The fleet averaged a 6.56% reduction in fuel consumed after FPC-1 fuel treatment.

2) Smoke density, with anomalies removed, was reduced approximately 27.7%.

APPENDICES

CARBON BALANCE METHOD TECHNICAL APPROACH:

All test instruments were calibrated and zeroed prior to both baseline and treated fuel data collection. The SGA-9000 NDIR exhaust gas analyzer was internally calibrated using Scott Calibration Gases (BAR 90 Gases), and a leak test on the sampling hose and connections was performed. The same procedure was repeated after each test segment to determine any instrument drift.

Each vehicle's engine was brought up to operating temperature at a set rpm and allowed to stabilize as indicated by the engine water and exhaust temperature, and exhaust pressure. No exhaust gas measurements were made until each engine had stabilized at the rpm selected for the test. Engine rpm was set using the dash mounted tachometer (with the exception of shovel's #1 and #4) and checked peridocally to prevent any change in engine speed during the data collection period. # 2 diesel was used exclusively throughout the evaluation. Fuel specific gravity (density) and temperature were also taken.

The baseline fuel consumption test consisted of a minimum of five sets of measurements of CO_2, CO, HC, O_2, and exhaust temperature and pressure made at 90 second intervals. Each engine was tested in the same manner. Engine rpm were also recorded at approximately 90 second intervals.

After the baseline test the fuel storage tanks were treated with FPC-1® at the recommended level of 1 oz. of catalyst to 40 gallons of fuel (1:5000 volume ratio). Each succeeding fuel shipment was also treated with FPC-1®. The equipment was operated on treated fuel until the final test was run.

During the two test segments, an internal self-calibration of the exhaust analyzer was performed after every two sets of measurements to correct instrument drift, if any.

From the exhaust gas concentrations of $C0_2$, CO, HC, and O_2 measured during the test, the average molecular weight of these gases, and the temperature and volumetric flow rate of the exhaust stream, the mass flow rate of the fuel to the engine (rate of fuel consumption) may be expressed as a engine "performance factor" which relates the fuel consumption of the treated fuel to the baseline. The calculations are based on the assumption that engine operating conditions are essentially the same throughout the test. Engines with known mechanical problems or having undergone repairs affecting fuel consumption are removed from the sample.

A sample calculation is found in Figure 2.

Details of Analysis

Figure 2.

SAMPLE CALCULATION FOR THE CARBON MASS BALANCE

BASELINE:

Equation 1 (Volume Fractions)

VFHC = 13.20/1,000,000
= 0.0000132

VFCO = 0.017/100
= 0.00017

$VFCO_2$ = 1.937/100
= 0.01937

VFO_2 = 17.10/100
= 0.171

Equation 2 (Molecular Weight)

$$Mwt1 = (0.0000132)(86)+(0.00017)(28)+(0.01937)(44)+(0.171)(32) + [(1-0.0000132-0.00017-0.01937-0.171)(28)]$$

$$Mwt1 = 28.995$$

Equation 3 (Calculated Performance Factor)

$$pf1 = \frac{2952.3 \times 28.995}{86(0.0000132)+13.89(0.00017)+13.89(0.01937)}$$

$$pf1 = 314{,}083$$

Equation 4 (CFM Calculations)

$$CFM = \frac{(d/2)^2\pi}{144} \bullet 1096.2\sqrt{\frac{Pv}{1.325\ \{P_B/(ET + 460)\}}}$$

d = Exhaust stack diameter in inches
Pv = Velocity pressure in inches of H_20
P_B = Barometric pressure in inches of mercury
ET = Exhaust temperature ^OF

$$CFM = \frac{(10/2)^2\pi}{144} \bullet 1096.2\sqrt{\frac{.80}{1.325\{30.00/(313.100 + 460)\}}}$$

CFM = 2358.37

Equation 5 (Corrected Performance Factor)

$$PF1 = \frac{314{,}083\ (313.1\ \text{deg F} + 460)}{2358.37\ \text{CFM}}$$

PF1 = 102,960

TREATED:

Equation 1 (Volume Fractions)

VFHC = 14.6/1,000,000
= 0.0000146

VFCO = .013/100
= 0.00013

$VFCO_2$ = 1.826/100
= 0.01826

VFO_2 = 17.17/100
= 0.1717

Equation 2 (Molecular Weight)

$$Mwt2 = (0.0000146)(86)+(0.00013)(28)+(0.01826)(44)+(0.1717)(32) + [(1-0.0000146-0.00013-0.01826-0.1717)(28)]$$

$$Mwt2 = 28.980$$

Equation 3 (Calculated Performance Factor)

$$pf2 = \frac{2952.3 \times 28.980}{86(0.0000146)+13.89(0.00013)+13.89(0.01826)}$$

$$pf2 = 333{,}308$$

Equation 4 (CFM Calculations)

$$CFM = \frac{(d/2)^2\pi}{144} \bullet 1096.2 \sqrt{\frac{Pv}{1.325\ \{P_B/(Te + 460)\}}}$$

d = Exhaust stack diameter in inches
Pv = Velocity pressure in inches of H_20
P_B = Barometric pressure in inches of mercury
Te = Exhaust temperature ^oF

$$CFM = \frac{(10/2)^2\pi}{144} \bullet 1096.2 \sqrt{\frac{.775}{1.325\{29.86/(309.02 + 460)\}}}$$

$$CFM = 2320.51$$

Equation 5 (Corrected Performance Factor)

$$PF2 = \frac{333{,}308\ (309.02 \text{ deg F} + 460)}{2320.51\ \text{CFM}}$$

$$= 110{,}459$$

Fuel Specific Gravity Correction Factor

Baseline Fuel Specific Gravity - Treated Fuel Specific Gravity/Baseline Fuel Specific Gravity +1

.840-.837/.840+1=1.0036

PF2 = 110,459 x Specific Gravity Correction

PF2 = 110,459 x 1.0036

PF2 = 110,857

Equation 6 (Percent Change in Engine Performance Factor:)

$$\% \text{ Change PF} = \frac{PF2 - PF1}{PF1} \times 100$$

% Change PF = [(110,857 - 102,960)/102,960](100)

= +7.67

Note: A positive change in PF equates to a reduction in fuel consumption.

RAW DATA WORK SHEETS

Company Name:	Gujarat	*Location*	Ambaji		*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2	Inches		
Engine Type:	Leyland 665	*Mile/Hrs*	107628			
Equipment Type:	Bus	*ID #:*	GJ1Z2750		*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*	80.2			
					Time:	935

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2016	214.4	0.58	0	26	1.49	18.1	
2016	214.4	0.6	0	26	1.49	18.1	
2016	214.4	0.56	0	19.5	1.46	18.2	
2026	215	0.6	0	23	1.44	18.2	
2030	214	0.6	0	28.5	1.44	18.3	
2030	212.6	0.58	0	24	1.43	18.3	
2022.333	**214.133**	**.587**	**.000**	**24.500**	**1.458**	**18.200**	Mean
7.089898918	**0.816496581**	**0.01632993**	**0**	**3.09838668**	**0.02639444**	**0.08944272**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
2.45E-05	0	0.01458333	0.182	28.9627543	417,630	3,618,369

Company Name:	Gujarat	*Location:*	Ambaji		*Test Date:*	5/3194
Test Portion:	Treated	*Stack Diam:*	2	Inches		
Engine Type:	Leyland 665	*Mile/Hrs:*	181190			
Equipment Type	Bus	*ID #:*	GJ1Z2750		*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	104			
SG Corr Factor:	1.01				*Time:*	1635

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2024	235	0.6	0	31	1.22	18.2	
2024	235	0.6	0	30	1.23	18.2	
2024	235.6	0.6	0	31	1.22	18.2	
2024	235.8	0.6	0	27.5	1.22	18.2	
2024	236	0.6	0	31	1.22	18.2	
2024	237	0.44	0	27.5	1.25	18.2	
2024	237	0.5	0	29	1.23	18.3	
2024	237.4	0.5	0	25	1.23	18.3	
2024	238	0.5	0	28	1.22	18.3	
2024.000	**236.311**	**.549**	**.000**	**28.889**	**1.227**	**18.233**	Mean
0	**1.077548658**	**0.06333333**	**0**	**2.07330922**	**0.01**	**0.05**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.89E-05	0	0.01226667	0.182333333	28.9272756	493,781	4,495,091

Performance factor adjusted for fuel density: 4,540,042

****% Change PF= 25.47 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

Company Name:	Gujart	*Location*	Ambaji		*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2	Inches		
Engine Type:	665 New	*Mile/Hrs*	52240			
Equipment Type:	Bus	*ID #:*	GJ1Z3125		*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*	80.2			
					Time:	1255

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2007	213	0.52	0	27.5	1.33	18.4	
2010	213	0.54	0	46	1.33	18.4	
2010	209.6	0.54	0	28.5	1.32	18.4	
2010	208	0.52	0	31	1.32	18.4	
2010	208	0.54	0	29	1.31	18.4	
2010	207.8	0.54	0	29.5	1.3	18.4	
2009.500	**209.900**	**.533**	**.000**	**31.917**	**1.318**	**18.400**	Mean
1.224744871	**2.487569095**	**0.01032796**	**0**	**6.99583209**	**0.01169045**	**0**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
3.19E-05	0	0.01318333	0.184	28.9487845	459,598	4,163,208

Company Name:	Gujart	*Location:*	Ambaji		*Test Date:*	5/31/94
Test Portion:	Treated	*Stack Diam:*	2	Inches		
Engine Type:	665 New	*Mile/Hrs:*	130518			
Equipment Type	Bus	*ID #:*	GJ1Z3125		*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	100			
SG Corr Factor:	1.01				*Time:*	1235

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2015	233	0.52	0	24.5	1.23	18	
2015	233	0.54	0	26.5	1.2	18	
2015	229	0.54	0	25	1.2	18.1	
2015	238.5	0.54	0	27	1.2	18.2	
2015	236.5	0.54	0	26	1.19	18.2	
2015	238	0.56	0	25.5	1.18	18.3	
2015.000	**234.667**	**.540**	**.000**	**25.750**	**1.200**	**18.133**	Mean
0	**3.656045222**	**0.01264911**	**0**	**0.93541435**	**0.0167332**	**0.12110601**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.58E-05	0	0.012	0.181333333	28.9188268	505,274	4,631,939

Performance factor adjusted for fuel density: 4,678,258

****% Change PF= 12.37 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

Company Name:	Gujarat	*Location*	Ambaji		*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2	Inches		
Engine Type:	Wiking BW	*Mile/Hrs*	47597			
Equipment Type:	Bus	*ID #:*	GJ1Z3029		*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*	80.2			
					Time:	

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2011	213.4	0.6	0	27	1.42	18.2	
2011	213.6	0.56	0	30.5	1.41	18.2	
2016	221.2	0.56	0	29.5	1.4	18.2	
2016	217	0.58	0	37.5	1.38	18.2	
2016	217.2	0.58	0	32.5	1.39	18.3	
2016	217	0.54	0	28	1.37	18.3	
2014.333	**216.567**	**.570**	**.000**	**30.833**	**1.395**	**18.233**	Mean
2.581988897	**2.86612398**	**0.02097618**	**0**	**3.7903386**	**0.01870829**	**0.05163978**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
3.08E-05	0	0.01395	0.182333333	28.9543217	435,001	3,830,472

Company Name:	Gujarat	*Location:*	Ambaji		*Test Date:*	5/31/94
Test Portion:	Treated	*Stack Diam:*	2	Inches		
Engine Type:	Wiking BW	*Mile/Hrs:*	126235			
Equipment Type	Bus	*ID #:*	GJ1Z3029		*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	104			
SG Corr Factor:	1.01				*Time:*	1550

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2019	239	0.58	0	26	1.4	17.7	
2019	240	0.58	0	26	1.39	17.7	
2019	240	0.56	0	28	1.39	17.7	
2019	241	0.56	0	29	1.39	17.8	
2019	241.2	0.56	0	26	1.37	17.8	
2019	241.6	0.56	0	28	1.37	17.8	
2019.000	**240.467**	**.567**	**.000**	**27.167**	**1.385**	**17.750**	Mean
0	**0.968848113**	**0.01032796**	**0**	**1.32916014**	**0.01224745**	**0.05477226**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.72E-05	0	0.01385	0.1775	28.9331757	438,511	3,940,530

Performance factor adjusted for fuel density: 3,979,935

****% Change PF= 3.90 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

Company Name:	Gujarat	*Location*	Ambaji	*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2 Inches		
Engine Type:	Hino (new)	*Mile/Hrs*	201840		
Equipment Type:	Bus	*ID #:*	2263	*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*	80.2		
				Time:	

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2020	209.4	0.48	0	23.5	1.36	18.5	
2020	209.2	0.5	0	23.5	1.36	18.5	
2020	209.8	0.48	0	24	1.36	18.6	
2020	205.6	0.47	0	27	1.33	18.5	
2020	207.8	0.48	0	33	1.32	18.4	
2022	209.6	0.48	0	21	1.33	18.5	
2022	209	0.48	0	23.5	1.33	18.4	
2020.571	**208.629**	**.481**	**.000**	**25.071**	**1.341**	**18.486**	Mean
0.975900073	**1.485164734**	**0.00899735**	**0**	**3.90969491**	**0.01772811**	**0.06900656**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
2.51E-05	0	0.01341429	0.184857143	28.9555113	453,369	4,318,399

Company Name:	Gujarat	*Location:*	Ambaji	*Test Date:*	5/31/94
Test Portion:	Treated	*Stack Diam:*	2 Inches		
Engine Type:	Hino (new)	*Mile/Hrs:*	262283		
Equipment Type	Bus	*ID #:*	2263	*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	104		
SG Corr Factor:	1.01			*Time:*	1510

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
1978	234	0.44	0	29	1.32	17.9	
1978	238	0.44	0	28	1.32	17.9	
1978	239	0.44	0	28	1.3	17.9	
1978	242	0.44	0	28	1.3	17.9	
1978	242	0.44	0	31	1.3	17.9	
1978	241	0.44	0	28	1.3	17.9	
1978.000	**239.333**	**.440**	**.000**	**28.667**	**1.307**	**17.900**	Mean
0	**3.076794869**	**0**	**0**	**1.21106014**	**0.01032796**	**0**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.87E-05	0	0.01306667	0.179	28.9267293	464,013	4,728,142

Performance factor adjusted for fuel density: 4,775,423

****% Change PF = 10.58 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

Company Name:	Gujarat	*Location*	Ambaji		*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2	Inches		
Engine Type:	Hino	*Mile/Hrs*	439958			
Equipment Type:	Bus	*ID #:*	GJ1Z657		*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*	80.2			
					Time:	1015

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2018	222	0.62	0	31.5	1.31	18.2	
2019	223	0.62	0	30	1.31	18.2	
2019	224	0.62	0	25.5	1.29	18.5	
2019	224.8	0.62	0	9	1.28	18.5	
2019	224.4	0.62	0	29.5	1.26	18.6	
2019	225	0.62	0	21.5	1.26	18.8	
2018.833	**223.867**	**.620**	**.000**	**24.500**	**1.285**	**18.467**	Mean
0.40824829	**1.157007635**	**0**	**0**	**8.42021377**	**0.02258318**	**0.23380904**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
2.45E-05	0	0.01285	0.184666667	28.9456877	473,005	4,015,132

Company Name:	Gujarat	*Location:*	Ambaji		*Test Date:*	5/31/94
Test Portion:	Treated	*Stack Diam:*	2	Inches		
Engine Type:	Hino	*Mile/Hrs:*	503725			
Equipment Type	Bus	*ID #:*	GJ1Z657		*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	100			
SG Corr Factor:	1.01				*Time:*	1635

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2034	239	0.62	0	29	1.27	18.1	
2034	245	0.62	0	31	1.26	18.1	
2034	245	0.62	0	28	1.25	18.1	
2034	246	0.62	0	29.5	1.25	18	
2034	246.6	0.6	0	31	1.25	18	
2034	247	0.6	0	31	1.24	18	
2034.000	**244.767**	**.613**	**.000**	**29.917**	**1.253**	**18.050**	Mean
0	**2.940521496**	**0.01032796**	**0**	**1.28127541**	**0.01032796**	**0.05477226**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.99E-05	0	0.01253333	0.1805	28.9242685	483,128	4,185,823

Performance factor adjusted for fuel density: 4,227,681

****% Change PF= 5.29 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

Company Name:	Gujarat	*Location*	Ambaji	*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2 Inches		
Engine Type:	Hino	*Mile/Hrs*			
Equipment Type:	Bus	*ID #:*	GJ1Z1805	*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*	80.2		
				Time:	1145

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2019	219.6	0.6	0	22	1.33	18.5	
2019	218.6	0.64	0	20	1.32	18.6	
2007	220.4	0.64	0	25	1.28	18.4	
2007	220	0.62	0	25	1.27	18.4	
2008	220	0.64	0	22	1.25	18.5	
2008	220	0.64	0	22.5	1.26	18.5	
2011.333	**219.767**	**.630**	**.000**	**22.750**	**1.285**	**18.483**	Mean
5.955389716	**0.625033332**	**0.0167332**	**0**	**1.94293592**	**0.03271085**	**0.07527727**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
2.28E-05	0	0.01285	0.184833333	28.9462528	473,422	3,974,684

Company Name:	Gujarat	*Location:*	Ambaji	*Test Date:*	5/31/94
Test Portion:	Treated	*Stack Diam:*	2 Inches		
Engine Type:	Hino	*Mile/Hrs:*	357460		
Equipment Type	Bus	*ID #:*	GJ1Z1805	*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	100		
SG Corr Factor:	1.01			*Time:*	1415

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2010	221	0.62	0	26	1.28	17.9	
2010	224	0.62	0	24	1.26	17.8	
2010	225	0.64	0	23	1.25	17.8	
2010	228	0.64	0	26	1.24	18	
2010	228	0.62	0	26	1.24	18	
2010	229	0.62	0	24	1.24	18	
2010.000	**225.833**	**.627**	**.000**	**24.833**	**1.252**	**17.917**	Mean
0	**3.060501048**	**0.01032796**	**0**	**1.32916014**	**0.01602082**	**0.09831921**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.48E-05	0	0.01251667	0.179166667	28.9183737	484,906	4,100,083

Performance factor adjusted for fuel density: 4,141,084

****% Change PF= 4.19 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

Company Name:	Gujarat	*Location*	Ambaji	*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2 Inches		
Engine Type:	Hino	*Mile/Hrs*			
Equipment Type:	Bus	*ID #:*	GJ1Z1804	*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*			
				Time:	1215

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2024	222.2	0.54	0	24.5	1.43	18	
2024	222.6	0.54	0	22.5	1.41	18.1	
2024	223	0.52	0	55	1.38	18.3	
2024	224.6	0.54	0	28	1.37	18.3	
2024	225.2	0.5	0	58	1.36	19.1	
2024	224.6	0.52	0	49	1.33	18.5	
2029	224.2	0.52	0	17.5	1.31	18.5	
2024.714	**223.771**	**.526**	**.000**	**36.357**	**1.370**	**18.400**	Mean
1.889822365	**1.157172251**	**0.01511858**	**0**	**16.9992997**	**0.04203173**	**0.36055513**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
3.64E-05	0	0.0137	0.184	28.9573087	441,746	4,071,909

Company Name:	Gujarat	*Location:*	Ambaji	*Test Date:*	5/31/94
Test Portion:	Treated	*Stack Diam:*	2 Inches		
Engine Type:	Hino	*Mile/Hrs:*	351629		
Equipment Type	Bus	*ID #:*	GJ1Z1804	*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	99.6		
SG Corr Factor:	1.01			*Time:*	1215

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2019	237.8	0.54	0	27	1.35	18.4	
2019	238.4	0.52	0	27	1.35	18.1	
2019	239	0.52	0	27	1.35	18.2	
2019	239	0.52	0	27	1.34	18.1	
2019	238.6	0.52	0	31	1.34	18.2	
2019	238.6	0.5	0	27	1.35	18.2	
2019	239	0.5	0	27	1.35	18.3	
2019	239	0.5	0	27	1.35	18.3	
2019	239	0.5	0	30	1.35	18.3	
2019	238.6	0.5	0	27	1.36	18.3	
2019.000	**238.700**	**.512**	**.000**	**27.700**	**1.349**	**18.240**	Mean
0	**0.391578004**	**0.01398412**	**0**	**1.49443412**	**0.00567646**	**0.09660918**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.77E-05	0	0.01349	0.1824	28.9470466	450,167	4,250,388

Performance factor adjusted for fuel density: 4,292,892

****% Change PF= 5.43 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

Company Name:	Gujarat	*Location*	Ambaji		*Date:*	11-Feb-94
Test Portion:	Baseline	*Stack Diam.*	2	Inches		
Engine Type:	Hino	*Mile/Hrs*	301670			
Equipment Type:	Bus	*ID #:*	GJ1Z1955		*Baro*	28.17
Fuel Sp. Gravity(SG	0.8330	*Temp:*	80.2			
					Time:	

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2028	194.4	0.52	0	22.5	1.3	19.9	
2002	201.2	0.52	0	3.5	1.29	18.1	
2002	201	0.58	0	22	1.29	18.5	
2000	203.2	0.54	0	29.5	1.29	18.6	
2000	206	0.56	0	32	1.32	18.6	
2000	210	0.56	0	35	1.32	18.6	
2005.333	**202.633**	**.547**	**.000**	**24.083**	**1.302**	**18.717**	Mean
11.14749598	**5.261812109**	**0.0242212**	**0**	**11.3287981**	**0.0147196**	**0.6112828**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
2.41E-05	0	0.01301667	0.187166667	28.9583302	467,319	4,158,468

Company Name:	Gujarat	*Location:*	Ambaji		*Test Date:*	5/31/94
Test Portion:	Treated	*Stack Diam:*	2	Inches		
Engine Type:	Hino	*Mile/Hrs:*	360727			
Equipment Type	Bus	*ID #:*	GJ1Z1955		*Baro:*	28.17
Fuel Sp. Gravity:	0.824	*Temp:*	100			
SG Corr Factor:	1.01				*Time:*	1700

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
2015	210	0.5	0	23	1.32	18.1	
2015	213	0.5	0	22	1.34	18.1	
2015	216	0.5	0	28.5	1.33	18	
2015	216	0.5	0	26.5	1.32	18	
2015	218	0.5	0	25	1.33	18.1	
2015	219	0.5	0	26.5	1.33	18.1	
2015	221	0.52	0	27.5	1.325	18.1	
2015.000	**216.143**	**.503**	**.000**	**25.571**	**1.328**	**18.071**	Mean
0	**3.716116765**	**0.00755929**	**0**	**2.37045304**	**0.00698638**	**0.048795**	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
2.56E-05	0	0.01327857	0.180714286	28.9367974	457,542	4,288,176

Performance factor adjusted for fuel density: 4,331,057

****% Change PF= 4.15 %**

*** A positive change in PF equates to a reduction in fuel consumption.*

1955

4.00 4.0

Carbon Mass Balance Field Data Form

Company: G.S.R.T.C Location: Ambaji Test Date: 11/2/94

Test Portion: Baseline: X Treated: _____ Exhaust Stack Diameter: ___Inches

Engine Make/Model: Hino Miles/Hours: Km 301670 I.D.#: G.J.1.Z.1955 Smoke Pen to 1.4.00 2.4.00

Type of Equipment: _____

Barometric Pressure: _____ inches of Mercury @: _____ (°F)

Fuel Specfic Gravity: 0.833 @: 80.2 (°F)

Start Time: _____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2028	194.4	0.52		18 to 27 22	1.30	19.9	
2002	201.2	0.52		350 to 7	1.29	18.1	
2002	201	0.58		18 to 26 22	1.29	18.5	
2000	203.2	0.54		24 to 35 29.5	1.29	18.6	
2000	206.	0.56		28 to 36 32	1.32	18.6	
2000	210.	0.56		31 to 39 35	1.32	18.6	

7.45

Finish Time: _____

8.10

Signature of Technicians:

_____ _____

Names of Customer Personnel Participating in Test:

_____ _____

P.R. Gaikwad
Asst. Supdt.

4 4

GJ-1·2 2263
RPM - 2011

Carbon Mass Balance Field Data Form

Company: GSRTC Location: Ambaji Test Date: 11-2-94
Test Portion: Baseline: X Treated: _____ Exhaust Stack Diameter: ___Inches

Source Part
1 - 4
2 - 4

Engine Make/Model: Hino (New) Miles/Hours: (Kms. 201840) I.D.#: 2263
Type of Equipment: _____

Barometric Pressure: _____ inches of Mercury @: _____ (°F)

Fuel Specfic Gravity: 0.833 @: 80.2 (°F)

Start Time: _____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
~~2011~~	~~209.8~~	~~0.5~~		~~18~~			
2020	(209.4) 209.2	(0.48) 0.5		19 to 28 (23.5)	1.36	18.5	
2020	209.8	0.48		17 to 31 (24)	1.36	18.6	
2020	205.6	0.47		22 to 32 (27)	1.33	18.5	
2020	207.8	0.48		28 to 38 (33)	1.32	18.4	
2022	209.6	0.48		15 to 27 (21)	1.33	18.5	
2022	2090	0.48		19 to 28 (23.5)	1.33	18.4	

8.15
Finish Time: 8.45

Signature of Technicians: (20

_____ _____

Names of Customer Personnel Participating in Test:

_____ _____

B R Gaekwad
Asst Supdt

GJ-12
3029
35
35

Smoke Part
1 - 3.5
2 - 3.5

Carbon Mass Balance Field Data Form

Company: G.S.R.T.C Location: Ambaji Test Date: 11.2.94

Test Portion: Baseline:_____ Treated:_____ Exhaust Stack Diameter: ___Inches

GJ-12

Engine Make/Model: ~~370 6765~~ 370 Miles/~~Hours~~: Kms 47597 I.D.#: 3029

Type of Equipment: VIKING BH

Barometric Pressure: _____ inches of Mercury @:_____ (°F)

Fuel Specfic Gravity: 0.833 @: 90.2 (°F)

Start Time:_____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2011	213.4 214.6	0.6		22 to 32	1.42	~~18.2~~ 18.2	
2011	213.6	0.56		26 to 30.5	1.41	18.2	
2016	221.2	0.56		27 to 29.5	1.40	18.2	
2016	217.6	0.58		29 to 32.5	1.38	18.2	
2016	217.2	0.58		28 to 32.5	1.39	18.3	
2016	217.0	0.54		25 to 28	1.37	18.3	

8.50

Finish Time: 9.25

Signature of Technicians:

_____ _____

Names of Customer Personnel Participating in Test:

_____ _____

B.R. Gaikwad
Asst. Supdt.

Carbon Mass Balance Field Data Form

Smoke Part- 1.4.5 2 4.5

Company: G.S.R.T.C. Location: Ambaji Test Date: 11-2-94
Test Portion: Baseline: X Treated: _____ Exhaust Stack Diameter: ___Inches
Engine Make/Model: Hino. Kms 439958 Miles/Hours: _____ I.D.#: G.J-1-2.657
Type of Equipment: _____

Barometric Pressure: _____ inches of Mercury @: _____ (°F)

Fuel Specfic Gravity: 0.833 @: 80.2 (°F)

Start Time: _____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2018	222	0.62		27 to 36 31.5	1.31	18.2	
2019	223	0.62		24 to 36 30	1.31	18.2	
2019	224	0.62		20 to 31 25.5	1.29	18.5	
2019	224.8	0.62		6 to 12	1.28	18.5	
2019	224.4	0.62		25 to 34 29.5	1.26	18.6	
2019	225	0.62		16 to 27 21.5	1.25	18.8	

10.15
Finish Time: ~~10.45~~

Signature of Technicians:

_____ _____

Names of Customer Personnel Participating in Test:

_____ _____

B.R. Gaikwad
Asstt. Engineer

3.3

Carbon Mass Balance Field Data Form

Smoke Part- 1. 3. 2-3

Company: GIS-R-T-C Location: Ambagji Test Date: 11-2-94
Test Portion: Baseline: X Treated: _____ Exhaust Stack Diameter: ___Inches

Engine Make/Model: Leyland 6.65 Engine Miles/Hours: 107628 I.D.#: GIS-1-2 2750
Type of Equipment: _____

Barometric Pressure: _____ inches of Mercury @: _____ (°F)

Fuel Specfic Gravity: 0.833 @: 80.2 (°F)

Start Time: _____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2016	214.4	0.58		21 to 31 N	1.49	18.1	
2016	214.4	0.6		21 to 31 N	1.49	18.1	
2016	214.4	0.56		15 to 24 N	1.46	18.2	
2026	215.	0.6		19 to 27 N	1.44	18.2	
2030	214.	0.6		25 to 32 N	1.44	18.3	
2030	212.6	0.58		19 to 29 N	1.43	18.3	

Finish Time: 9.35 / 10.00

Signature of Technicians:

_____ _____

Names of Customer Personnel Participating in Test:

_____ _____

B R Gaikwad
Asst Supdt

1805

A-1 4-0

Carbon Mass Balance Field Data Form

Company: G.S.R.T.C Location: Ambaji Test Date: 11-2-94

Test Portion: Baseline: X Treated: _____ Exhaust Stack Diameter: ___Inches

321774 Kms AB on -11-2 94

Engine Make/Model: HINO Engine Miles/Hours: _____ I.D.#: GJ-1Z-1805

Type of Equipment: _____

Source Part
1 - 4.02
2 - 4.00

Barometric Pressure: _____ inches of Mercury @: _____ (°F)

Fuel Specfic Gravity: 0.833 @: 80.2 (°F)

Start Time: _____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2019	219.6	0.60		17 to 27 N	1.33	18.5	
2019	218.6	0.64		17 to 23 N	1.32	18.6	
2007	220.4	0.64		19 to 31 N	1.28	18.4	
2007	220.	0.62		19 to 31 8	1.27	18.4	
2008	220	0.64		15 to 29 N	1.25	18.5	
2008	220	0.64		17 to 28 N	1.26	18.5	

11.45

Finish Time: 12-10

Signature of Technicians:

_____ _____

Names of Customer Personnel Participating in Test:

B R Calat
Asst Supdt

_____ _____

1804 ✓

4.0 4.0 ✓

Carbon Mass Balance Field Data Form

Company: G.S.R.T.C Location: Ambaji Test Date: 11.2.94

Test Portion: Baseline: X Treated: _____ Exhaust Stack Diameter: ___Inches

306121 km

Engine Make/Model: Hino Engine Miles/Hours: _____ I.D.#: G.J-1.2.1804

Type of Equipment: _____

Smoke
1.4.0
2.4.0

Barometric Pressure: _____ inches of Mercury @: _____ (°F)

Fuel Specfic Gravity: 0.833 @: 80.2 (°F)

Start Time: _____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2023	222.2	0.54		19 to 30 24.5	1.43	18.0	
2024	226.6	0.54		19 to 26 22.5	1.41	18.1	
2024	223	0.52		51 to 59 55	1.38	18.3	
2024	224.6	0.54		22 to 34 28	1.37	18.3	
2024	225.2	0.50		52 to 64 58	1.36	19.1	
2024	224.6	0.52		42 to 56 49	1.37	18.5	
2029	224.2	0.52		14 to 21 17.5	1.31	18.5	12.15

Finish Time: 12.35

Signature of Technicians:

_____ _____

Names of Customer Personnel Participating in Test:

_____ _____

B.R. Gaikwad
Army Sergeant

✓

3125

3.0 3.0

Carbon Mass Balance Field Data Form

2.25 CM

Company: G.S.R.T.C. Location: Ambaji Test Date: 11-2-94

Source Part- 1-3. 2-3

Test Portion: Baseline: X Treated: _____ Exhaust Stack Diameter: _____ Inches

Engine Make/Model: 6.65 New Miles/Hours: Km. 52240 I.D.#: GJ-1Z-3125

Type of Equipment: _____

Barometric Pressure: _____ inches of Mercury @: _____ (°F)

Fuel Specfic Gravity: 0.833 @: 80.2 (°F)

Start Time: _____

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2007	213	0.52		24 to 31	1.33	18.4	
2010	213	0.54		37 to 45	1.33	18.4	
2010	209.6	0.54		26 to 31	1.32	18.4	
2010	208	0.52		27 to 35	1.32	18.4	
2010	207.8	0.54		26 to 32	1.31	18.4	
2010	207.8	0.54		25 to 34	1.30	18.4	

12.55

Finish Time: _____ 13-10

Signature of Technicians:

_____ _____

Names of Customer Personnel Participating in Test:

.89

B R Gale
Boot Support

_____ _____

Carbon Mass Balance Field Data Form

Company: GSRTC Location: Ambaji Test Date: 31/5/94.

Test Portion: Baseline:_____ Treated:_____ Exhaust Stack Diameter: ___Inches

Engine Make/Model: 6.65 130518 Km. AB on 30-5-94 Miles/Hours:_____ I.D.#: 2 3125 -

Type of Equipment: _____

Fuel Specfic Gravity: _____ @: 100 (°F)

Barometric Pressure: 0.995 inches of Mercury Start Time: 12.35

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2015	235 to 233	0.52	0.05	24 to 25	1.23	18.00	
2015	231 to 235	0.54	0.05	25 to 28	1.20	18.00	
2015	225 to 233	0.54	0.05	25	1.20	18.1	
2015	232 to 245	0.54	0.05	27	1.20	18.2	
2015	228 to 245	0.54	0.05	26	1.19	18.2	
2015	227 to 233	0.56	0.05	24 to 27	1.18	18.3	

Names of Customer Personnel Participating in Test:

P.P. Gabel
Asstt Supdt

M/E O

M. E (OPN)

Signature of Technicians:

Carbon Mass Balance Field Data Form

Company: GSRTC Location: Ambaji Test Date: 31-5-94

Test Portion: Baseline:_____ Treated:_____ Exhaust Stack Diameter: ___Inches

Engine Make/Model: Leyland Hino Miles/Hours: 35+629 Kms as on 30.5.94 I.D.#: GJ-1 Z 1806

Type of Equipment: _____

Fuel Specific Gravity: _____ @: 99.6 (°F)

Barometric Pressure: 28.17 mts. 956 ~~inches of Mercury~~ Start Time: 12.15 - 12.35

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2079	237.8	0.54	0.02	27	1.35	18.4	
2019	238.4	0.52		27	1.35	18.1	
2019	239.	0.52	0.05	27	1.35	18.2	
2019	239	0.52		27	1.34	18.1	
2019	238.6	0.52		31.	1.34	18.2	
2019	238.6	0.5		27	1.35	18.2	
2019	239.	0.5		27	1.35	18.3	
2019	239	0.5		27	1.35	18.3	
2019	239	0.5		30	1.35	18.3	
2019	238.6	0.5		27	1.36	18.3	

1 - 6

2 - 6

SMOKE NUMBER TAKEN FROM TAILPIPE

Names of Customer Personnel Participating in Test:

Asst Supdt

MGO

31/5/94

M - E (COPY)

Signature of Technicians:

Carbon Mass Balance Field Data Form

Company: GISRTC Location: Ambaji Test Date: 31-5-94

Test Portion: Baseline:_____ Treated:_____ Exhaust Stack Diameter: ___Inches

Engine Make/Model: HIND. ENG. Miles/Hours: 352460 km AS on 30.5.94 I.D.#: GJ.1.Z 1805

Type of Equipment: _____

Fuel Specfic Gravity: _____ @: 100 (°F)

Barometric Pressure: 0.956 28.17 inches of Mercury

Start Time: 14.15 / 14.30

1805
1 - 2.5
2 2.5

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2010	221	0.62	0.03	26	1.28	17.9	
2010	224	0.62	0.04	24	1.26	17.8	
2010	225	0.64	0.03	23	1.25	17.8	
2010	228	0.64	0 02	26	1.24	18.00	
2010	228	0.62	0.03	26	1.24	18.00	
2010	229	0.62	0.03	24	1.24	18.00	

Names of Customer Personnel Participating in Test:

B.R.Gaikwad
Asst Supdt

M.E(OPN) 31/5/94

Signature of Technicians:

Carbon Mass Balance Field Data Form

(3) 3/35 GJ 12 2750 (3) 3/35 GJ 12 2750

R.T.C Location: Ambaji Test Date: 31-5-94

Test Portion: Baseline:______ Treated:______ Exhaust Stack Diameter: ___Inches

Engine Make/Model: Leyland · 665 Miles/Hours: 181190 Kms as on 30.5.94 I.D.#: GJ-1-2-2750

Type of Equipment: ____________

Fuel Specfic Gravity: 0.824 @: 104 (°F)

Barometric Pressure: 0.954 (26.17) inches of Mercury Start Time: 4.35 pm 4.55

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2024	235	0.60	0.0	31	1.22	18.2	
2024	235	0.60	0.0	29 to 31	1.23	18.2	
2024	235.6	0.60	0.0	31	1.22	18.2	
2024	235.8	0.60	0.0	26 to 29	1.22	18.2	
2024	236	0.60	0.0	30 to 32	1.22	18.2	
2024	237	0.44	0.0	26 to 29	1.25	18.2	
2024	237	0.50	0.0	29	1.23	18.3	
2024	237.4	0.50	0.2	28	1.23	18.3	
2024	238	0.50	0.0	28	1.22	18.3	

Smoke 1 – 3 2 – 3

Names of Customer Personnel Participating in Test:

B.R. Galat, Asstt Supdt   [signature] M.E.O

N.B. cylinder head Gasket Replaced on 13/5/94 [signature] 31/5/94 M.E.(OPN)

Signature of Technicians:

[signature]

Carbon Mass Balance Field Data Form

657

Company: G S R T C Location: Ambaji Test Date:

Test Portion: Baseline: Treated: Exhaust Stack Diameter: In.

Smoke

1 -3.0

2 -3.0

502725 Km 03 m - 30-5-44

Engine Make/Model: HINO. Miles/Hours: I.D.#: GJ 1 Z 657

Type of Equipment:

Fuel Specfic Gravity: @: 100 (°F)

Barometric Pressure: 0.954 (28.17) inches of Mercury Start Time: 14.35

14.55

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2034	239	0.62	0.62	27 to 31	1.27	18.1	
2034	245	0.62	0.01	31	1.26	18.1	
2034	245	0.62	0.02	28	1.25	18.1	
2034	246	0.62	0.02	28 to 31	1.25	18.0	
2034	246.6	0.60	0.02	31	1.25	18.0	
2034	247	0.60	0.03	31	1.24	18.0	

Names of Customer Personnel Participating in Test:

B R Patel — Asstt Supdt

[signature] — M/EO

[signature] 31/5/94 — M. E OPN

Signature of Technicians:

[signature]

Carbon Mass Balance Field Data Form

Company: G.S.R.T.C Location: Ambaji Test Date:________ 3029

Test Portion: Baseline:______ Treated:______ Exhaust Stack Diameter: ___Inches

126235 kms as on 30-5-94

Engine Make/Model: 370 · Viking Miles/Hours:________ I.D.#: GJ-1-Z 3029 1 - 2

Type of Equipment: ____________________ 2 - 2

Fuel Specfic Gravity: ______________ @: 104 (°F)

Barometric Pressure: 0.954 28.17 inches of Mercury Start Time: 13.50 14.10

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2019	239	0.58	0.04	26	1.40	17.7	
2019	240	0.58	0.04	26	1.39	17.7	
2019	240	0.56	0.03	28	1.39	17.7	
2019	241	0.56	0.04	29	1.39	17.8	
2019	241.2	0.56	0.04	26	1.37	17.8	
2019	241.6	0.56	0.05	28	1.37	17.8	

Names of Customer Personnel Participating in Test:

B.A. Gala (signature) Asst Supdt

(signature) M.E.O

(signature) 31/5/94 M.E.(OPN)

Signature of Technicians:

(signature)

Carbon Mass Balance Field Data Form

Company: G.S.R.T.C Location: Ambaji Test Date: 31-5-94

Test Portion: Baseline:_____ Treated:_____ Exhaust Stack Diameter: ___Inches

Engine Make/Model: HINO NEW Miles/Hours: 26283. Km As on. 30-5-93 I.D.#: GJ-1-2 2263

Type of Equipment: _____

Fuel Specfic Gravity: _____ @: 106 (°F)

Barometric Pressure: 0.954 (28.17) inches of Mercury Start Time: 15.10

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
1978	234	0.44	0.04	28 to 30	1.32	17.9	
1978	238	0.44	0.04	28	1.32	17.9	
1978	239	0.44	0.08	28	1.30	17.9	
1978	242	0 44	0.05	28	1.30	17.9	
1978	242	0.44	0.04	31	1.30	17.9	
1978	241	0.44	0.05	28	1.30	17.9	

Names of Customer Personnel Participating in Test:

B.R Gaikwad
Asst Supdt

M.E (OPN)

Signature of Technicians:

2267

Smoke
1 - 4.5
2 - 4.5

Carbon Mass Balance Field Data Form

(3) (2.5)

Company: G.S.R.T.C Location: Ambaji Test Date: 31-5-94

GJ 12 1955 : smoke.

Test Portion: Baseline:_____ Treated:_____ Exhaust Stack Diameter: ___Inch

360 727 Kms As on 30.5.94

Engine Make/Model: HINO Miles/Hours:_____ I.D.#: GJ 12 1955

Type of Equipment: _____

1 – 3
2 2.5

Fuel Specfic Gravity: 0.824 C-a @: 100 (°F)

Barometric Pressure: 0.954 (28.17) inches of Mercury Start Time: 17.00

17.15

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	NO_x
2015	210	0.50	0.03	21 to 25 (23)	1.32	18.1	
2015	213	0.50	0.05	19 to 25 (22)	1.34	18.1	
2015	216	0.50	0.05	25 to 32 (28.5)	1.33	18.00	
2015	216	0.50	0.03	24 to 29 (26.5)	1.32	18.0	
2015	218	0.50	0.03	23 to 27 (25)	1.32 to 1.34	18.1	
2015	219	0.50	0.03 to 0.05	23 to 30 (26.5)	1.32 to 1.34	18.1	
2015	221	0.52	0.03 to 0.06	22 to 33 (27.5)	1.31 to 1.34	18.1	
			HOSE LEAK DUE TO METAL PIECE ATTACHED TO EXHAUST PIPE				

Names of Customer Personnel Participating in Test:

B.R.Gohel
GSRTC Supdt

M.E.O

Dhol. 31/5/94
M.E (OPR)

Signature of Technicians: