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FIELD EVALUATION OF FPC-1®

Fuel Performance Catalyst

T.G. Lee Foods, Inc.
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Abstract

This report summarizes the findings of a field trial conducted by T.G. Lee Foods, Inc., Orlando, Florida, to determine the effectiveness of a unique combustion catalyst, FPC-1®, upon engine performance, fuel efficiency and exhaust emissions. The principal test method was a steady-state engine test utilizing the carbon mass balance technique for determining fuel consumption. The method also permits the analysis of exhaust emissions and smoke.

T.G. Lee fleet managers also provided miles per gallon records for analysis. Although not as controlled as the steady-state test, these data are supportive of steady-state test findings. The two tests determined the addition of FPC-1® to the fuel created the following benefits:

(1) Fuel consumption was reduced by an average of 7.77% using the carbon mass balance method for determining fuel consumption. This could result in annual fuel savings of approximately $63,000, as demonstrated in Appendix 4.

(2) An increase in miles per gallon of approximately 2% was observed when comparing baseline fuel fleet records to FPC-1® treated fuel fleet records.

(3) Smoke emissions were reduced 8.17% after FPC-1® fuel treatment.

(4) Carbon monoxide emissions were reduced 3.02% with FPC-1® treated fuel.

I. Introduction

FPC-1® Fuel Performance Catalyst is a burn rate modifier or catalyst proven to reduce fuel consumption and increase engine horsepower in several recognized, independent laboratory tests, and dozens of independent field trials. The catalyst also has a positive impact upon the products of incomplete combustion, primarily soot (smoke).

The intent of the current trial at T.G. Lee Foods, Inc. is to determine the degree of fuel consumption, and smoke reduction resulting from the addition of the FPC-1 catalyst to the diesel fueling a selected tractor. The test methodology for determining fuel consumption is the carbon mass balance (cmb). The cmb method measures the carbon containing products of the combustion process (CO_2, CO, HC) found in the exhaust, rather than directly measuring fuel flow into the engine.

This report summarizes the results of baseline fuel consumption and emissions data, and computes the engine performance factors (mass flow rates) for the same.

II. Discussion of Carbon Mass Balance Method

The carbon mass balance method eliminates virtually all of the variables associated with field testing for fuel consumption changes. The method requires no modifications to fuel lines or engines, and can be conducted in a short period of time at minimal expense.

Instead of measuring fuel flow into the engine (ie., the weight or volume of the fuel), measurements are made of the exhaust gases leaving the engine. More precisely, the carbon containing gases in the exhaust are measured. The method is based upon the Law of Conservation of Matter, which states that atoms can neither be created nor destroyed. The engines only source of carbon is the fuel it consumes; therefore, the carbon measured in the exhaust must come from the fuel. By measuring the carbon going out of the engine in the form of products of combustion, the amount of carbon entering the engine can be determined.

Carbon Balance Calculation

The carbon leaving the engine is mainly in the form of carbon dioxide (CO_2), carbon monoxide (CO), unburned hydrocarbons (HC), and particulate (smoke). By collecting data while the engine is operating at a given load and speed, the fuel flow rate into the engine can be accurately determined. When engine load and speed, along with other factors influencing fuel consumption are reproduced and/or monitored to make appropriate corrections, the carbon mass balance method can be used to confidently determine changes in fuel consumption that might result from the use of a fuel catalyst, such as FPC-1®.

With the carbon mass balance method, engine efficiency is expressed in terms of engine performance factors. To calculate any change in engine performance, separate measurements are made with the engine running on base fuel (untreated) and FPC-1® treated fuel. Any changes are stated as percentage changes from baseline.

A copy of the carbon balance equations is found on Figure 1 (Appendix 1). A sample calculation for illustration purposes is also attached (see Figure 2, Appendix 1). Additionally, the carbon balance can be used to determine the effect of FPC-1® upon harmful emissions, such as carbon monoxide and smoke.

III. Instrumentation

Precision, state-of-the-art instrumentation is used to measure the concentrations of carbon containing gases in the exhaust stream and other factors related to fuel consumption and engine performance. The instruments and their purposes are listed below:

1) A Sun Electric SGA-9000 non-dispersive infrared (NDIR) four gas analyzer - measures the volume percent of CO2, CO, and oxygen (O2) in the exhaust, and the parts per million(ppm) of HC.
2) EPA I/M Calibration Gases - known gases used to internally calibrate the NDIR analyzer.
3) A twenty (20) foot sampling train and stainless steel exhaust gas probe - inserted into the engine exhaust pipe draws a sample of exhaust gases to the analyzer.
4) A Fluke Model 52 hand held digital thermometer and wet/dry thermocouple probe - measures exhaust, ambient, and fuel temperature.
5) A Dwyer Magnehelic 2000 Series Pressure Gauge and pitot tube - measures exhaust air velocity and/or pressure.
6) A Monarch Contact/Noncontact digital tachometer and magnetic tape - measures engine rpm when dash mounted tachometers are unavailable.
7) A hydrometer and flask - determines fuel specific gravity (density).
8) Barometric pressure is acquired from local airport or weather station.
9) A Bacharach TrueSpot Smokemeter - for smoke density determination.

With the exception of engine speed, fuel density, and ambient readings, all data are collected by simply inserting probes into the exhaust stream while the engine is running at a fixed rpm and load, and the vehicle is stationary. No modifications or device installations are made to the fuel system, nor are normal equipment work cycles disrupted.

After baseline testing, the test vehicle was operated with FPC-1® fuel treatment approximately 300 to 500 hours to ensure complete engine conditioning.

IV. Technical Approach

The following technical approach was observed during the baseline test, and was reproduced during the treated fuel test segment:

1) All instruments are calibrated according to accepted protocol.

2) A sample of fuel is drawn from the fuel tank on each piece of equipment. Using a hydrometer, fuel specific gravity is recorded.

3) Each piece of equipment to be tested is parked, brakes locked, and run out-of-gear at a specific engine speed (RPM) until engine water, oil, and exhaust temperature, and exhaust pressure have stabilized. Engine speed is controlled using either a hand held phototach or the tachometer in the cab.

4) Engine hours (or mileage) are taken from hour meters or odometers installed on the equipment.

5) After engine stabilization, the exhaust gas sampling probe is inserted into the exhaust stream. The Autocal button is depressed and after the LED readouts clear, test personnel take multiple readings of carbon dioxide, carbon monoxide, unburned hydrocarbons, and oxygen, along with engine speed, exhaust temperature and pressure.

6) Periodically, ambient air temperature, atmospheric pressure, and relative humidity are recorded. Temperature readings are taken at the test site. Other ambient readings are acquired from local weather information services.

7) All data are recorded until technicians are confident the information is consistent and reproducible.

8) After completing the baseline, all test fleet fuel will be *treated with FPC-1®. All equipment will operate as normal for approximately 300 to 500 hours, at which time the above procedure will be reproduced without alteration, except for FPC-1 fuel treatment in the test fleet.

*In lieu of bulk fuel treatment, FPC-1® was packaged in concentrations for individual truck treatment at each fueling.

The data relative to the rate of fuel consumption were used by UHI, ICE and T.G. Lee managers/engineers to calculate the percent change in fuel consumption before and after FPC-1® fuel treatment.

V. Baseline and Treated Data Calculations

The data collected during the baseline and treated fuel carbon balance tests are summarized on the attached computer printouts (Appendix 2). From these data the volume fraction (VF) of each gas is determined and the average molecular weight (Mwt) of the exhaust gases computed. Next, the engine performance factor (pf) based upon the carbon mass in the exhaust is computed. The pf is finally corrected for intake air temperature and pressure (barometric), and total exhaust mass yielding a corrected engine performance factor (PF). The baseline and treated PFs are tabulated on Table 1 of Appendix 2. Table 2 of Appendix 2 summarizes the effect of FPC-1® on carbon monoxide. Smoke spot (smoke density) numbers are found on Table 3 of Appendix 2..

VI. Discussion of Results

Fuel Consumption Reduction

T.G. Lee Food Services, Inc. provided only one vehicle for testing. In order to provide a larger body of data, the single test vehicle was tested at four different rpm settings, 1200, 1400, 1600 and 1800.

The vehicle showed consistent reductions in fuel consumption, after FPC-1® fuel treatment, at each of the four rpm settings. The reductions ranged from 8.52% to 6.78%. The average improvement in fuel consumption over the range of rpm settings was 7.77%. The baseline and treated PFs are presented on Table 1 of Appendix 2.

Smoke and Emissions Reduction

Reductions in smoke density in the exhaust of the trucks averaged 8.17%. These data are found on Table 3 of Appendix 2. Smoke reductions are typically in the range of 20% to 30%. The lower smoke reduction achieved in this test indicates inconsistent treatment. This was confirmed with discussions with T.G. Lee personnel. Carbon monoxide, although not a critical parameter in this test, was reduced 3.02% (see Table 2).

VII. Analysis of Fleet Miles Per Gallon

Determining the effect of FPC-1® upon fuel consumption (mpg) is less reliable using fleet mpg records than when using the carbon mass balance test method. Although the collection of fleet mileage and fuel consumption data is relatively easy to do, it is far more difficult to ascertain the impact of uncontrolled variables upon these data. These variables are many (load, idle time, drivers, fuel energy content and combustion characteristics, weather conditions, road conditions, etc.) and are constantly changing. Increases in engine efficiency can be masked by these changes in driving conditions. For this reason, UHI recommends the carbon mass balance method above all other methods. However, if a large body of data can be collected before and after FPC-1® fuel treatment, and while weather conditions are similar, a statistical analysis of these data will reveal the positive trend in fuel savings created by the use of FPC-1®. This positive trend will be directly reflected in your bottom line.

The T.G. Lee fleet treated with FPC-1® experienced a general improvement in fuel economy. Treatment began in September 1995. A spot check on September 21, 1995 indicated that the fuel was consistently treated during the period. The mileage per gallon increased 2.43% above the baseline for September, 1995. This is consistent with other fleets tested in the first month of treatment. The effectiveness of FPC-1® has been shown, in both laboratory and field tests, to increase gradually for the first 300 to 500 hours of use.

The mileage per gallon in October, 1995 was higher than the baseline, but not as high as expected. However, from discussions with T.G. Lee personnel and an examination of the amount of FPC-1® used during October, 1995, it does not appear that the fuel was treated at each fueling.

The fleet mileage statistics are presented below:

	Avg MPG	% Improvement
Baseline Period		
Test Vehicle-June 1995	6.178	N/A
Test Vehicle-July 1995	6.078	N/A
Test Vehicle-August 1995	6.012	N/A
Test Vehicle-(June 1995 through August 1995)	6.083	N/A
Treated Period		
Test Vehicle-Sept. 1995	6.231	2.43%
Test Vehicle-Oct. 1995 (through 10/30)	6.196	1.86%
Test Vehicle-Sept. 1995 through Oct. 1995	6.201	2.18%

These improvements in efficiency are considered conservative as there is a conditioning period at the beginning of the testing phase. Also, by treating the individual tractor as opposed to bulk treating the fuel, we were unable to verify that the tractor was treated with FPC-1® at each fueling. In conversations with T.G. Lee personnel, it became apparent that the vehicle was not treated at every fueling. A couple of missed treatments would impact the mileage results recorded in T.G. Lee's fleet statistics. Although the test indicated positive results, we feel that had we been bulk treating, the field trial results would have been more significant.

Refrigeration Units

Testing of 84 reefer units at T. G. Lee Food Services, Inc. in a previous test of FPC-1®, resulted in a 10.2% improvement in hours per gallon while these units operated with FPC-1® . The test of the reefer units was compiled from T.G. Lee data. No carbon mass balance testing was performed on the reefer units. This test report was previously provided under a separate cover.

VIII. Conclusions

(1) Fuel consumption was reduced by a fleet average of 7.77% using the carbon mass balance method for determining fuel consumption. This could result in annual fuel savings of approximately $63,000, as demonstrated in Appendix 4.

(2) An increase in miles per gallon of approximately 2% was observed when comparing baseline fuel fleet records to FPC-1® treated fuel fleet records.

(3) Smoke emissions were reduced 8.17% after FPC-1® fuel treatment.

(4) Carbon monoxide emissions were reduced 3.02% with FPC-1® treated fuel.

RECOMMENDATION

Based on the aforementioned conclusions, T.G. Lee Food Services, Inc. should proceed with treatment of the entire fuel supply, with FPC-1®. Monitoring and analysis of fleet maintenance and fuel records as well as additional Carbon Mass Balance testing can be conducted as part of the treatment program.

APPENDIX 1

APPENDIX 2

TABLE 1:

SUMMARY OF CARBON BALANCE FUEL CONSUMPTION CHANGES

UNIT #	ENGINE TYPE	RPM	BASE Pf	FPC Pf	%CHG
455588	Cat 3406B	1200	814,200	875,510	7.53
455588	Cat 3406B	1400	666,701	723,531	8.52
455588	Cat 3406B	1600	537,203	580,296	8.02
455588	Cat 3406B	1800	432,117	461,419	6.78
					AVG +7.77%

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

TABLE II:
CARBON MONOXIDE

UNIT #	ENGINE TYPE	RPM	BASE CO	FPC CO
455588	CAT 3406B	1200	.020	.020
455588	CAT 3406B	1400	.020	.020
455588	CAT 3406B	1600	.023	.020
455588	CAT 3406B	1800	.030	.030
AVERAGE			**.0232**	**.0225**
%CHG				**-3.02%**

TABLE III:
SMOKE SPOT NUMBERS (EXHAUST SMOKE DENSITY)

UNIT #	ENGINE TYPE	RPM	BASE SS	FPC SS
455588	CAT 3406B	1200	7.0	5.5
455588	CAT 3406B	1400	7.0	7.0
455588	CAT 3406B	1600	8.0	7.5
455588	CAT 3406B	1200	8.0	7.5
AVERAGE			**7.5**	**6.875**
%CHG				**-8.17%**

APPENDIX 3

Company Name:	TG Lee	Location:	Orlando, FL	Date:	5/1/95
Test Portion:	Baseline	Stack Diam.	5 Inches		
Engine Type:	Cat 3406B / 400	Mile/Hrs	330000		
Equipment Type:	Over the road truck	ID #:	455588	Baro:	29.96
Fuel Sp. Gravity(SG):	.837	Temp:	87.4		
				Time:	4:00

RPM	Exh. Temp	Pr Inch	CO	HC	CO2	O2	
1200	260.00	0.65	0.02	6	1.09	18.7	
1200	259.00	0.65	0.02	6	1.09	18.5	
1200	261.00	0.65	0.02	6	1.09	19	
1200	262.00	0.65	0.02	5	1.09	19	
1200	263.00	0.65	0.02	5	1.09	18.8	
1200	261.00	.650	.020	5.600	1.090	18.800	Mean
0	1.581	.000	.000	.548	.000	.212	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
0.0000056	0.0002	.011	.188	28.927	579,666	814,200

Company Name:	TG Lee	Location:	Orlando, FL	Date:	10/27/95
Test Portion:	Treated	Stack Diam.	5 Inches		
Engine Type:	Cat 3406B / 400	Mile/Hrs	386700		
Equipment Type	Over the road truck	ID #	455588	Baro:	28.84
Fuel Sp. Gravity:	0.842	Temp:	89		
SG Corr Factor:	.994			Time:	4:00

RPM	Exh. Temp	Pr Inch	CO	HC	CO2	O2	
1200	253.20	0.60	0.02	8	1.02	18.80	
1200	255.40	0.60	0.02	8	1.01	18.90	
1200	256.00	0.62	0.02	8	1.00	18.80	
1200	259.00	0.62	0.02	9	1.02	18.80	
1200	259.00	0.62	0.02	8	1.01	18.90	
1200.000	256.520	.612	.020	8.200	1.012	18.840	Mean
0	2.492	.011	.000	.447	.008	.055	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
8.20E-06	0.0002	.010	.188	28.916	622,095	880,772

Performance factor adjusted for fuel density: 875,510

****% Change PF = 7.53**

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

Company Name:	TG Lee	Location:	Orlando, FL	Date:	5/1/95
Test Portion:	Baseline	Stack Diam:	5 Inches		
Engine Type:	Cat 3406B / 400	Mile/Hrs:	330000		
Equipment Type:	Over the road truck	ID #:	455588	Baro:	29.56
Fuel Sp. Gravity(SG):	.837	Temp:	87.4		
				Time:	4:00

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
* This reading considered an anomoly and removed from sample							
1400	282.00	0.9	0.02	8	1.15	18.8	
1400	282.00	0.9	0.02	8	1.13	18.8	
1400	282.00	0.9	0.02	9	1.14	18.7	
1400	283.00	0.9	0.02	9	1.17	18.7	
1400.000	282.250	.900	.020	8.500	1.148	18.750	Mean
0	.500	.000	.000	.577	.017	.058	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
8.50E-06	0.0002	.011	.188	28.934	550,472	666,701

Company Name:	TG Lee	Location:	Orlando, FL	Date:	10/27/95
Test Portion:	Treated	Stack Diam:	5 Inches		
Engine Type:	Cat 3406B / 400	Mile/Hrs:	386700		
Equipment Type:	Over the road truck	ID #:	455588	Baro:	28.84
Fuel Sp. Gravity:	0.842	Temp:	89		
SG Corr Factor:	.994			Time:	4:00

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
1400	279	0.8	0.02	9	1.07	18.5	
1400	280.8	0.8	0.02	9	1.09	18.8	
1400	280.2	0.8	0.02	8	1.09	18.8	
1400	281	0.8	0.02	8	1.09	18.8	
1400	280.6	0.85	0.02	7	1.08	18.8	
1400.000	280.320	.810	.020	8.200	1.084	18.740	Mean
0	.795	.022	.000	.837	.009	.134	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
8.20E-06	0.0002	.011	.187	28.924	581,867	727,879

Performance factor adjusted for fuel density: 723,531

****% Change PF= 8.52**

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

Company Name:	TG Lee	Location:	Orlando, FL		Date:	5/1/95
Test Portion:	Baseline	Stack Diam:	5	Inches		
Engine Type:	Cat 3406B / 400	Mile/Hrs:	330000			
Equipment Type:	Over the road truck	ID #:	455588		Baro:	29.96
Fuel Sp. Gravity(SG):	.836	Temp:	87.4			
					Time:	4:00

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
1600	309.00	1.20	0.03	9	1.24	18.80	
1600	306.00	1.25	0.02	8	1.24	18.80	
* This reading considered an anomoly and removed from sample							
* This reading considered an anomoly and removed from sample							
1600	308.00	1.25	0.02	8	1.23	18.80	
1600.000	307.667	1.233	.023	8.333	1.237	18.800	Mean
0	1.528	.029	.006	.577	.006	.000	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
8.33E-06	0.000233333	.012	.188	28.950	510,564	537,203

Company Name:	TG Lee	Location:	Orlando, FL		Date:	10/27/95
Test Portion:	Treated	Stack Diam:	5	Inches		
Engine Type:	Cat 3406B / 400	Mile/Hrs:	386700			
Equipment Type:	Over the road truck	ID #:	455588		Baro:	28.84
Fuel Sp. Gravity:	0.841	Temp:	89			
SG Corr Factor:	.994				Time:	4:00

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
1600	301.40	1.15	0.02	4	1.13	18.50	
1600	302.40	1.15	0.02	4	1.15	18.60	
1600	301.80	1.15	0.02	4	1.15	18.50	
1600	301.80	1.15	0.02	4	1.15	18.70	
1600	301.80	1.20	0.02	3	1.15	18.60	
1600	300.60	1.20	0.02	3	1.15	18.60	
1600.000	301.633	1.167	.020	3.667	1.147	18.583	Mean
0	.599	.026	.000	.516	.008	.075	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
3.67E-06	0.0002	.011	.186	28.927	552,187	583,787

Performance factor adjusted for fuel density: 580,296

****% Change PF = 8.02**

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

Company Name:	TG Lee	*Location:*	Orlando, FL	*Date:*	5/1/95
Test Portion:	Baseline	*Stack Diam:*	5 Inches		
Engine Type:	Cat 3406B / 400	*Mile/Hrs*	330000		
Equipment Type:	Over the road truck	*ID #:*	455588	*Baro*	29.96
Fuel Sp. Gravity(SG)	.836	*Temp:*	86.8		
				Time:	4:00

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
1800	328.00	1.70	0.03	8	1.34	18.30	
1800	329.00	1.70	0.03	8	1.32	18.30	
1800	332.00	1.70	0.03	8	1.33	18.10	
1800	333.00	1.65	0.03	8	1.33	18.10	
1800	331.00	1.65	0.03	10	1.34	18.20	
1800.000	330.600	1.680	.030	8.400	1.332	18.200	Mean
0	2.074	.027	.000	.894	.008	.100	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw1	pf1	PF1
8.40E-06	0.0003	.013	.182	28.942	472,320	432,117

Company Name:	TG Lee	*Location:*	Orlando, FL	*Date:*	10/27/95
Test Portion:	Treated	*Stack Diam:*	5 Inches		
Engine Type:	Cat 3406B / 400	*Mile/Hrs:*	386700		
Equipment Type	Over the road truck	*ID #:*	455588	*Baro:*	28.84
Fuel Sp. Gravity:	0.841	*Temp:*	89		
SG Corr Factor	.994			*Time:*	4:00

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	
1790	324.00	1.65	0.03	5	1.22	18.50	
* This reading considered an anomoly and removed from sample							
1790	324.00	1.65	0.03	6	1.23	18.50	
1790	325.60	1.65	0.03	8	1.21	18.50	
1790	320.20	1.65	0.03	8	1.22	18.50	
1790	325.00	1.65	0.03	8	1.22	18.60	
1790.000	323.760	1.650	.030	7.000	1.220	18.520	Mean
0	2.104	.000	.000	1.414	.007	.045	Std Dev

VFHC	VFCO	VFCO2	VFO2	Mtw2	pf2	PF2
7.00E-06	0.0003	.012	.185	28.936	514,734	464,195

Performance factor adjusted for fuel density: 461,419

****% Change PF= 6.78**

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

APPENDIX 4

T.G. LEE FOOD SERVICES, INC.
PROJECTED SAVINGS
FROM USING FPC-1® TREATED FUEL

Fuel purchased annually (gallons) (1)		1,168,000
Cost per gallon (2)		$1.02
Total cost of untreated fuel		$1,191,360
Fuel purchased annually (gallons)	1,168,000	
Percentage savings	7.77%	
Gallons saved per year	90,754	
Net gallons purchased per year (1,168,000 - 90,754)	1,077,246	
Cost per gallon (2)	$1.02	
Cost of fuel	$1,098,791	
Cost of FPC-1 1,077,246 gallons / 5,000 X $135	29,086	
Total cost of fuel treated with FPC-1	$1,127,877	1,127,877
Net savings		$63,483

(1) Per phone call to Bart Luskuski, fuel used in 5 week period (89,205 road and 23,126 off road) 22,466 gallons per week of combined road and off road fuel, or 1,168,000 gallons annually.

(2) Cost per gallon from October, 1995, Report 8002 Unit Fuel Analysis for unit 455588. Total cost $1,336.38 divided by total fuel used 1,304.4 gallons = $1.02 / gallon.

INTERNATIONAL COMBUSTION ENHANCEMENT, INC.
CARBON MASS BALANCE FIELD DATA FORM

SHEET (1)

Company Name:	TG Lee	*Location*	Orlando, FL	*Date:*	10/27/95
Test Portion:	Treated	*Stack Diam.*	5 Inches		
Engine Type:	FORD L9000 CAT 3406B /400	*Mile/Hrs*	386,700 *		
Equipment Type:	Over the road truck	*ID #:*	455588	*Baro*	
Fuel Sp. Gravity(SG)	.842	*Temp:*		*Time:*	4:10 p.m.

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	Smoke
1200	253.2	.6	.02	8	1.02	18.8	5.5
	255.4	.6	.02	8	1.01	18.9	
	256.0	.62	.02	8	1.00	18.8	
	259.0	.62	.02	9	1.02	18.8	
	259.0	.62	.02	8	1.01	18.9	
1400 (1420)	279.0	.80	.02	9	1.07	18.5	7
	280.8	.80	.02	9	1.09	18.8	
	240.2	.80	.02	8	1.09	18.8	
	281.0	.8	.02	8	1.09	18.8	
	280.6	.85	.02	7	1.08	18.8	

Signature of Technicians: [signature]

* BASELINE MILES TAKEN 3/95 / TREATMENT BEGAN 9/1/95

INTERNATIONAL COMBUSTION ENHANCEMENT, INC.
CARBON MASS BALANCE FIELD DATA FORM

SHEET (2)

Company Name:	TG Lee	Location	Orlando, FL	Date:	10/27/95
Test Portion:	Treated	Stack Diam.	5 Inches		
Engine Type:	FORD L9000	Mile/Hrs	386,700		
Equipment Type:	Over the road truck	ID #:	455588	Baro	
Fuel Sp. Gravity(SG)	.841 ~~.847~~	Temp:		Time:	

RPM	Exh Temp	Pv Inch	CO	HC	CO2	O2	Smoke
1600	301.4	1.15	.02	4	1.13	18.5	7.5
	302.4	1.15	.02	4	1.15	18.6	
	301.8	1.15	.02	4	1.15	18.5	
	301.8	1.15	.02	4	1.15	18.7	
	301.8	1.20	.02	3	1.15	18.6	
	300.6	1.20	.02	3	1.15	18.6	
~~1600~~ 1790	324.0	1.65	.03	5	1.22	18.5	7.5
	319.4	1.65	.03	6	1.22	18.5	
	324.0	1.65	.03	6	1.23	18.5	
	325.6	1.65	.03	8	1.21	18.5	
	320.2	1.65	.03	8	1.22	18.5	
	325.0	1.65	.03	8	1.22	18.6	

Signature of Technicians: ____________________

Carbon Mass Balance Field Data Form

Company: T.G. LEE Location: YARD, ORLANDO Test Date:
Test Portion: Baseline: Treated: Exhaust Stack Diameter: 5 Inches

Engine Make/Model: CAT 3406B/400 Miles/Hours: 330004 I.D.#: 455588
Type of Equipment: FORD LTS 9000/1992 3 AXLE ROAD TRACTOR

START

Fuel Specific Gravity: .837 @ 88.2° @: 88.2 (°F)
Barometric Pressure: 29.96 Inches of Mercury
Intake Air Temperature: 87.4 (°F) Start Time: 1600

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	Smoke Number
1200	260	.65	.02	6	1.09	18.7	7
	259	.65	.02	6	1.09	18.5	↓
	261	.65	.02	6	1.09	19.0	↓
	262	.65	.02	5	1.09	19.	↓
	263	.65	.02	5	1.09	18.8	↓
(1420) 1400	281	.9	.02	8	1.29	18.7	7
	282	.9	.02	8	1.15	18.8	↓
	282	.9	.02	8	1.13	18.8	↓
	282	.9	.02	8 9	1.14	18.7	↓
	283	.9	.02	8 9	1.17	18.7	↓

End Time

Names of Customer Personnel Participating in Test:

Signature of Technicians:

Carbon Mass Balance Field Data Form

Company: T.G. LEE Location: ________ Test Date: ________
Test Portion: Baseline: ______ Treated: ______ Exhaust Stack Diameter: 5 Inches

Engine Make/Model: ________ Miles/Hours: ______ I.D.#: 455588
Type of Equipment: ________

Fuel Specific Gravity: .836 @: 90 (°F)
Barometric Pressure: ________ Inches of Mercury
Intake Air Temperature: 86.8 (°F) Start Time: 1635

RPM	Exhaust Temp °F	P Inches of H_2O	% CO	HC ppm	% CO_2	% O_2	Smoke Number
1600	309	1.2	.03	9	1.24	18.8	8
	306	1.25	.02	8	1.24	18.8	↓
	308	1.25	.03	9	1.35	18.7	↓
	308	1.25	.03	9	1.32	18.8	↓
	308	1.25	.02	8	1.23	18.8	↓
1800	328	~~1.34~~ 1.7	.03	8	~~1.34~~	18.3	8
	329	1.7	.03	8	1.32	18.3	↓
	332	1.7	.03	8	1.33	18.1	↓
	333	1.65	.03	8	1.33	18.1	↓
	331	1.65	.03	10	1.34	18.2	↓

End Time ________

Names of Customer Personnel Participating in Test:

____________ ____________

Signature of Technicians: