

Regulated and Unregulated Emissions Comparison for Three Tier II Non-Road Diesel Engines Operating on Ethanol Diesel Blends

March 7, 2003 to March 29, 2004

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*Southwest Research Institute
San Antonio, Texas*



NREL

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Operated for the U.S. Department of Energy
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FOREWORD

This report describes a project performed for the National Renewable Energy Laboratory (NREL) by the Department of Engine and Emissions Research (DEER) of Southwest Research Institute[®]. The work was to characterize the engine performance and exhaust emissions characteristics of three, Tier II compliant, non-road diesel engines operating on various ethanol in diesel blends versus a certification-grade diesel as a reference. The project is a cooperative research effort between the federal government, state government and private industry to thoroughly test and evaluate the use of E diesel fuels in diesel engines, with direct input from the Original Equipment Manufacturer (OEM). Funding for the project has been provided by John Deere & Company, US DOE through the National Renewable Energy Laboratory (NREL), the Illinois Department of Commerce and Economic Opportunity (DCEO), the Renewable Fuels Association (RFA), the state of Minnesota, O2 Diesel Inc., GE Betz, Lubrizol, Inc., Growmark, Inc. and corn grower organizations from Illinois, Iowa, Kansas, Kentucky, Nebraska, Michigan, Minnesota and Ohio.

This program, authorized by NREL Subcontract No. ACE-3-33011-01, began on March 7, 2003 and was completed March 29, 2004. The unregulated pollutant analysis project was based on SwRI Proposal No. 08-36343 to NREL. The NREL portion of the project was identified as SwRI Project No. 06586, and the Illinois Corn Growers Association-funded project, which supported the operation of the engines and supplied the fuels and additives, was identified as SwRI Project No. 06811.

The NREL technical monitor for this program was Dr. Robert McCormick. The SwRI project manager was Mr. Jeff J. White. The project leader was Mr. Vlad Ulmet. Individual task leaders included Mr. Robert Fanick, Mr. Patrick Merritt, Dr. Joseph Pan, and Mr. Michael Starr. Mr. James Boylan, supervisor, was responsible for Mr. William Valuk and Mr. Chase Trammell, who operated the engine test cell.

EXECUTIVE SUMMARY

This report describes the laboratory efforts to characterize the exhaust emissions characteristics of three Tier II compliant, non-road, diesel engines operating on various ethanol in diesel blends versus a certification-grade diesel as a reference fuel. Blending of ethanol into diesel fuel may become an important petroleum displacement strategy, if certain technical barriers can be overcome: most importantly the issues of low flashpoint and tank vapor flammability. It is also important to understand the pollutant emission impacts of blending ethanol into diesel fuel. The effects that blending of ethanol has on fuel system durability and engine operability must also be addressed.

In this study, regulated emissions (hydrocarbons, oxides of nitrogen, carbon monoxide, and particulate matter) as well as various unregulated emissions (individual hydrocarbons, ethanol, aldehydes and ketones, polynuclear aromatic hydrocarbons (PAH), nitro-PAH, and soluble organic fraction of particulate matter) were analyzed. Duplicate ISO 8178-C1 eight-mode and FTP smoke tests were performed on reference diesel fuel and three ethanol/diesel blends, containing 7.7 percent, 10 percent, and 15 percent ethanol, respectively. Three suppliers provided additives for improvement of the characteristics and stability of ethanol blended in diesel fuel. Batches of fuel were prepared at each ethanol concentration with all three additives, resulting in a 10-fuel matrix (including reference diesel fuel). The nine alcohol-blended fuels were distributed among the three test engines in a way that each engine experienced operation with each additive and each ethanol concentration. The three engines were all manufactured by John Deere, and were 6.8-L, 8.1-L, and 12.5-L in displacement.

As expected, increasing ethanol concentration led to higher emissions of acetaldehyde (increases ranging from 27 to 139 percent) and ethanol (from trace levels to levels as high as 52 mg/hp-hr). Smoke and particulate matter emissions decreased with increasing ethanol concentration. PM emissions decreased from 13 to 30 percent. Except on the 6.8-L engine, carbon monoxide emissions also decreased, by as much as 15 percent, with increasing ethanol concentration. For the 6.8-L engine, CO increased by as much as 22.6 percent. NO_x emissions were reduced with ethanol use on the 6.8-L and 12.5-L engines, with reductions ranging from 5 to 9 percent. Emissions of NO_x increased by as much as 2 percent on the 8.1-L engine.

Toxics such as benzene and 1,3-butadiene were reduced with the use of ethanol. Benzene emissions were reduced by up to 50 percent with the ethanol-blended fuels. Emissions of 1,3-butadiene were also substantially decreased, with reductions ranging from 24 to 82 percent.

Isolated trends were noted for certain PAH compounds. There was a decrease in 1-nitropyrene with use of ethanol in all cases. Particulate phase 1-nitropyrene was reduced from 18 to 62 percent. There was also a general increase in heavy PAH compounds in the particulate phase with ethanol use, and although less pronounced, a general decrease in light PAH compounds in the particulate phase with ethanol use.

Operation of the 6.8-L and 8.1-L engines was without problems. However, problems were experienced when first operating the 12.5-L engine with ethanol-blended fuel. Power output of this engine was consistent with the manufacturer's ratings when operating on straight diesel fuel,

but after a period of operation on ethanol-blended fuel, the power output would drop off. The engine was extensively diagnosed and after finding nothing wrong, a new ECU was installed. This modification did not alter its behavior on the ethanol-blended fuel. It was determined that the performance problems were caused by the ethanol-blended fuel boiling within the fuel system, because the boiling point of the ethanol-blended fuel is so much lower than base diesel fuel. The fuel is routed through the head on this engine design, as is common practice with unit injection. In addition, a portion of the unused fuel is re-circulated through the head, rather than being returned to the fuel tank. It is likely that the fuel became too hot and began to boil while passing through the head. A small cooler was installed to reduce the fuel temperature prior to reaching the injectors. After this modification was installed, the engine performed well, and testing proceeded without incident.

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LIST OF ACRONYMS AND ABBREVIATIONS

ΔP	Delta P – change in pressure
40 CFR PART 89	Code of Federal Regulations, Title 40, Part 89
ALC	Alcohols
ALD	Aldehydes
ASTM	American Society for Testing Materials
bhp	brake horsepower
C-B	Carbon balance
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CVS	Constant Volume Sampler
DEER	Department of Engine and Emissions Research
DNPH	Dinitrophenylhydrazine
FTP	Federal Test Procedure
g	gram or grams
GC-FID	Gas Chromatography-Flame Ionization Detector
HC	Hydrocarbons
hp	Horsepower
hp-hr	Horsepower-hour
HPLC	High Performance Liquid Chromatography
ICGA	Illinois Corn Growers Association
IHC	Individual hydrocarbons
in	Inch or inches
kPa	Kilopascals
kW	Kilowatts
L	Liter
lb-ft	Pound-feet
N-m	Newton-meters
NO _x	Oxides of Nitrogen
n-PAH	Nitro Polycyclic Aromatic Hydrocarbons
PAH	Polycyclic Aromatic Hydrocarbons
PAH-plus	PAH and n-PAH collectively
PUF	Polyurethane foam
PUF/XAD-2	PUF sandwiched with XAD-2 (a trade name) resin
rpm	Revolutions per minute
SOF	Soluble organic fraction
SwRI [®]	Registered trade mark for Southwest Research Institute [®]

I. INTRODUCTION

Blending of ethanol into diesel fuel may become an important petroleum displacement strategy, if certain technical barriers can be overcome: most importantly, the issues of low flashpoint and tank vapor flammability. It is also important to understand the pollutant emission impacts of blending ethanol into diesel fuel.

The Department of Engine and Emissions Research (DEER) at Southwest Research Institute[®] (SwRI[®]) performed a research program entitled, Regulated and Unregulated Emissions Comparison for Three Tier II Non-Road Diesel Engines Operating on Ethanol-Diesel Blends. The project objectives were funded in part by the Illinois Corn Growers Association (ICGA) and in part by the National Renewable Energy Laboratory (NREL). The project involved tests of three different models of Tier II compliant, non-road, John Deere diesel engines to establish the overall impact of diesel-ethanol blends on regulated engine exhaust emissions, along with a number of unregulated toxic compounds. Four different fuel formulations were used in the engine performance and exhaust emissions evaluations, including certification diesel fuel, a 7.7 percent ethanol/ diesel fuel blend, a 10 percent ethanol/diesel fuel blend, and a 15 percent ethanol/ diesel fuel blend.

II. OBJECTIVE AND APPROACH

The objective of this project was to characterize the impact on exhaust emissions of regulated and unregulated pollutants from diesel engines operating on various ethanol-diesel fuel blends versus certification diesel fuel. Three different models of John Deere diesel engines were used. The engines were tested for gaseous emissions and smoke according to EPA Part 89 requirements. In addition to the fixed gases (total hydrocarbons, oxides of nitrogen, carbon monoxide, carbon dioxide) and particulate matter, analyses were performed (on the 8-mode tests only) for individual hydrocarbons, aldehydes, ketones, alcohols, polynuclear aromatic hydrocarbons (PAH), 1-nitropyrene, and soluble organic fraction (SOF) of particulate matter. Table 1 provides an overview of the joint ICGA-NREL test program.

TABLE 1. OVERVIEW OF TEST PROGRAM

Step	Description
1	Install 8.1-L engine in emission test cell.
2	Prepare for testing using No. 2D certification diesel fuel.
3	Perform two FTP smoke tests.
4	Perform two 8-mode tests with sampling for regulated and unregulated emissions.
5	Switch to 7.7 percent ethanol/No. 2D certification diesel fuel blend.
6	Repeat Steps 3 and 4.
7	Switch to 10 percent ethanol/No. 2D certification diesel fuel blend.
8	Repeat Steps 3 and 4.
9	Switch to 15 percent ethanol/No. 2D certification diesel fuel blend.
10	Repeat Steps 3 and 4.
11	Repeat Steps 1 - 10 with 6.8-L engine
12	Repeat Steps 1 - 10 with 12.5-L engine

III. WORK PLAN

The test engines and fuels, and procedures followed in this program are described in the following sections.

A. Test Engines

The John Deere Company provided three heavy-duty, Tier II compliant, non-road diesel engines for this test program. These engines represent different fuel system and emissions control technologies and varied in displacement from 6.8 to 12.5 Liters. The engine characteristics are summarized in Table 2.

TABLE 2. TEST ENGINE CHARACTERISTICS

Test Order	1	2	3
Engine Model	6081HRW28	6068	6125HRW02
Serial Number	6081H213451	68EPX000098	6125H012204
Displacement, L	8.1	6.8	12.5
Rated Speed, rpm	2200	2000	2100
Rated Power, kW (hp)	224 (301)	129 (172)	375 (500)
Intermediate Speed, rpm	1400	1400	1500
Peak Torque, N-m (lb-ft)	1361 (1004)	725 (535)	1989 (1467)
Inlet Restriction, kPa (in. water)	2.99 (12)	2.99 (12)	2.99 (12)
Exhaust Restriction, kPa (in. mercury)	7.45 (2.2)	7.45 (2.2)	7.45 (2.2)
Turbocharged/Inter-cooled	Yes/Yes	Yes/Yes	Yes/Yes
Inter-cooling type	Air/Air	Air/Air	Air/Air
Inter-cooler Outlet Temperature, °C (°F)	60 (140)	60 (140)	60 (140)
Inter-cooler ΔP , kPa (in. water)	12.45 (50)	12.45 (50)	12.45 (50)
Injector Type	High pressure, common rail, ECU	Rotary pump line nozzle, ECU	Electronic unit injector, ECU

B. Test Fuels

The reference fuel for this program was No. 2D certification diesel. Three different blends of ethanol in this reference fuel were prepared, at concentrations of 7.7 percent, 10 percent, and 15 percent by volume. Three additive suppliers provided material to enhance the stability and performance of the ethanol in diesel blends. The identity of the additive in a particular fuel blend is confidential, to prevent any use of the data for commercial advantage. For the sake of this program, they are simply designated as “A,” “B,” and “C.” For each of the three ethanol concentrations, a separate blend was prepared utilizing one of each of the three additives. Thus, there resulted a matrix of nine candidate fuels, and one reference fuel. However, only one of each of the three additive blends for each ethanol concentration was run in each engine. Please see Table 3 for matrix of engines and fuels. The SwRI internal fuel codes are also shown. It is

clear from Table 3 that each of the three additives was run in one of the engines at each ethanol concentration.

TABLE 3. TEST FUEL MATRIX

Engine ID	Additive	Cert. Fuel	7.7% Blend	10% Blend	15% Blend
John Deere 8.1-L Serial No. 6081H213452	NONE	EM-4970-F			
	A		EM-4929-F		
	B			EM-4936-F	
	C				EM-4951-F
John Deere 6.8-L Serial No. 68EXP000098	NONE	EM-4970-F			
	A				EM-4949-F
	B		EM-4930-F		
	C			EM-4937-F	
John Deere 12.5-L Serial No. 6125H012204	NONE	EM-4970-F			
	A			EM-4935-F	
	B				EM-4950-F
	C		EM-4932-F		

Instructions provided by each additive manufacturer were followed for addition of additive during fuel blending. The fuel ethanol was provided by ICGA. Two tankers of ethanol were delivered and stored in SwRI Tanks 22 and 23. They have been maintained with a flow of nitrogen in the tank headspace to preclude absorption of water from the atmosphere during storage. Analyses of key properties of the contents of these two tanks are presented in Table 4.

TABLE 4. ANALYTICAL RESULTS FOR ETHANOL STOCK

Test Parameter	Test Method	Units	Tank 22	Tank 23
API @ 60°F	D4052	none	47.6	47.6
Specific Gravity @ 60°F		none	0.7901	0.7901
Density @ 15°C		grams/L	789.7	789.7
Ethanol content	D5501	weight percent	96.1	95.8
		volume percent	95.6	95.3
Water content	D6304	percent	0.548	0.548

Characterizations of the test fuels, funded separately by NREL, are presented in Table 5. Where two values appear, the results of duplicate analyses are given. In some cases, questionable results were obtained on first analyses and replicate analyses were requested. One should bear in mind that the ASTM methods are not necessarily designed to accommodate a fuel such as an ethanol-diesel blend. Ethanol is suspended in an emulsion by virtue of the co-solvents and other substances in the various additive packages.

EM-4895-F is the internal designation of the on-highway diesel used in preparing the ethanol blends. The remaining EM- codes are the internal identification codes used in our fuel handling,

storage, and inventory system. Another batch of low-sulfur certification diesel was used in the baseline emissions measurements of the engines, designated EM-4970-F. A detailed description of its properties is presented in Appendix A.

C. Test Procedures

Exhaust emission characterization was performed as specified under CFR Title 40, Part 89, entitled, “Control of Emissions from New and In-Use Non-road Compression-Ignition Engines.” For nonroad heavy-duty engines, the regulation outlines specific requirements for setting up the test engine and pre-test activities, as well as all aspects of conducting the testing and collection and analysis of gaseous samples. The 8-mode test cycle, described in Table 1 of Appendix B of this subpart, was utilized in this test program.

Two consecutive runs of the 8-mode test and two FTP smoke tests were used for each fuel composition. Table 6 shows the Part 89 test modes and weighting factors. In order to accumulate a sufficient dilute exhaust sample for unregulated emissions analysis, each mode was run for a number of minutes equivalent to its weight factor in percent. For example, a mode with a 0.10 weight factor received a ten-minute sampling period. This approach extended the total sampling duration for the 8-mode test from 40 to 100 minutes. For the PAH and n-PAH sampling, one set of collection media was used to collect a composite sample for each 8-mode test.

TABLE 5. TEST FUEL CHARACTERISTICS

Test Parameter	ASTM Test Method	EM-4895-F Base Fuel	EM-4929-F 7.7% EtOH A	EM-4930-F 7.7% EtOH B	EM-4932-F 7.7% EtOH C	EM-4935-F 10% EtOH A	EM-4936-F 10% EtOH B	EM-4937-F 10% EtOH C	EM-4949-F 15% EtOH A	EM-4950-F 15% EtOH B	EM-4951-F 15% EtOH C
Copper Corrosion	D-130	1B	1B	1B	1B	1B	1B	1B	1B	1B	1B
Cloud Point, °C	D-2500	-20	8	8	5	10	12	-6	15	18	-7
Water and Sediment, mL	D-2709	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Viscosity @ 40 °C, cSt	D-445	2.376	2.127	2.110	2.140	2.015	2.093	2.062	1.964	1.962	2.120
Ash Content, mass %	D-482	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Residue (10% Bottom), mass %	D-524	0.11	0.09	0.14	0.26	0.13	0.15	0.12	0.13	0.18	0.21
Cetane Number	D-613	47.4	45.4/48.6	50.5/49.9	48.5/49.1	45.4/46.6	45.4/47.5	45.4/46.9	45.4/47.3	47.7/47.6	47.8/47.4
Flash Point, °C	D-93	63.3	13.9	10.0	13.9	12.2	10.6	10.6	9.4	11.1	9.4
HFRR, Wear Scar, mm	D-6079	0.525	0.280	0.320	0.410	0.240	0.280	0.405	0.295	0.335	0.410
BOCLE, Scuffing Load, g	D-6078	3800	5350	4350	4200	6500	5750	3550	3850	6050	4400
Density, g/L	D-4052	839.9	835.9	836.8	835.4	835.0	837.0	834.3	833.0	835.2	832.1
Specific Gravity		0.8405	0.8364	0.8373	0.8359	0.8355	0.8375	0.8348	0.8336	0.8358	0.8326
API		36.9	37.7	37.5	37.8	37.9	37.5	38.0	38.3	37.8	38.5
Carbon, mass %	D-5291	86.85	84.29	83.90	84.38	84.23	83.78	83.12	82.67	83.13	81.13
Hydrogen, mass %		13.11	13.08	13.08	12.99	13.26	13.12	13.28	13.13	13.02	12.99
Oxygen, mass % by difference		0.04	2.63	3.02	2.63	2.51	3.10	3.6	4.20	3.85	5.88
Distillation, °F	D-86										
IBP		356.1	164.1	167.1	154.6	141.3	155.9	183.1/172.7	149.5	171.2	143.4
5%		383.2	173.5	173.7	169.7	166.5	172.3	183.3/174.5	168.0	172.1	173.3
10%		407.3	229.5	309.6	175.7	176.4	175.2	179.9/172.6	172.9	172.6	173.7
15%		422.8	387.9	393.6	355.6	177.2	271.9	178.8/243.2	178.8	224.9	178.0
20%		436.8	416.0	414.1	401.9	294.2	401.3	179.5/396.0	230.1	381.8	333.8
30%		461.4	446.4	444.6	429.2	413.8	434.7	322.8/429.7	416.1	427.9	422.1
40%		480.6	470.1	468.5	461.6	452.3	460.5	413.8/455.0	449.6	454.0	454.5
50%		497.9	490.1	486.7	483.0	477.0	481.4	456.9/476.6	475.9	475.4	480.3
60%		514.4	508.6	506.0	501.5	498.8	500.5	485.0/495.2	496.4	494.9	500.6
70%		533.0	527.8	526.2	521.6	519.0	520.4	507.4/516.9	516.5	515.7	521.7
80%		555.0	551.1	551.4	546.1	543.8	544.3	533.9/540.8	539.1	541.0	545.1
90%		585.9	582.9	585.7	581.7	578.2	576.2	569.9/573.4	570.6	578.8	579.0
95%		611.6	612.0	610.5	604.1	608.8	599.3	600.8/598.9	591.6	600.3	607.7
FBP		636.7	635.0	620.5	629.0	630.1	633.9	624.7/626.4	630.8	616.3	632.2
Recovery, mL		98.2	98.0	95.6	95.0	97.5	96.1	97.4/96.4	95.4	96.1	97.9
Loss, mL		1.3	1.5	1.2	3.8	1.4	2.9	1.6/2.7	3.2	2.9	1.0
Residue, mL		0.5	0.5	3.2	1.2	1.1	1.0	1.0/0.9	1.4	1.0	1.1

TABLE 6. PART 89 TEST MODES AND WEIGHTING FACTORS

Mode	1	2	3	4	5	6	7	8
Speed	Rated				Intermediate			Idle
Percent Torque	100	75	50	10	100	75	50	0
Weight Factor	0.15	0.15	0.15	0.10	0.10	0.10	0.10	0.15

Table 7 summarizes procedures followed for instrument and sample system calibrations, changing fuels, determining engine performance, preparing and stabilizing emission measurement systems, and performing the test work to obtain the exhaust samples needed. Table 8 illustrates the pattern of runs that was made on each engine for each fuel blend. Results of in-cylinder pressure measurements will be made in a separate report to the ICGA.

TABLE 7. TEST PLAN FOR EMISSIONS AND PERFORMANCE CHARACTERIZATION OF EACH FUEL BLEND

Step	Description
1	Perform emissions system and dynamometer system checks and calibrations.
2	Install the engine in emissions capable test cell.
3	Prepare sufficient quantity of fuel blends in drums.
4	Perform practice cycles to check dilution tunnel settings, sampling systems, instrument ranges, and engine performance on No. 2D certification grade fuel.
5	Change to selected test fuel and perform two consecutive FTP transient smoke tests.
6	Confirm emissions instrument calibrations as required. Validate CVS gaseous and particulate sampling systems using propane recovery techniques.
7	Perform the operating sequence given in Table 8 to accumulate CVS-dilute exhaust, background, and blank emission samples. Distribute samples as required for analysis. Determine HC, CO, NO _x , NO, PM, and SOF. For ALD, and IHC, take a dilute exhaust sample and a background sample over each mode by accumulating a proportional sample of gases. For PAH, and 1-nitropyrene, (collectively referred to as "PAH-plus"), accumulate a composite dilute exhaust sample over all modes, and a blank to represent dilution tunnel background.
8	Repeat Steps 5 through 7 for each test fuel.
9	Review available test data, and assuming no faults are noted, remove engine from the test cell.
10	Summarize and report results.

**TABLE 8. RUN PATTERN FOR COLLECTING SAMPLES AND
BLANKS FOR EACH ENGINE**

Step	Description
1	Warm-up dynamometer and engine.
2	Perform practice runs of 8-mode test.
3	Allow CVS to run for approximately one hour without engine exhaust being introduced.
4	Load sample media.
5	Perform 8-mode test while sampling for Test 1.
6	Remove exposed sample media - run CVS for about 10 minutes.
7	Load sample media for Blank 1.
8	Operate CVS while sampling for blank using approximately the same time used to collect dilute exhaust samples.
9	Remove exposed blank media.
10	Load sample media.
11	Perform 8-mode test while sampling for Test 2.
12	Remove exposed sampling media - run CVS for about 10 minutes.
13	Load sample media for Blank 2.
14	Operate CVS while sampling for blank using approximately the same time used to collect dilute exhaust samples.
15	Remove exposed blank media.

D. Emissions Sampling and Analysis Procedures – Regulated Emissions

Regulated emissions determined on the 8-mode test included total hydrocarbon (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), carbon dioxide (CO₂), and total particulate matter (PM). These emissions were collected and analyzed utilizing procedures that conform to the requirements stated in 40 CFR Part 89.

E. Emissions Sampling and Analysis Procedures – Unregulated Emissions

The target list for unregulated emissions included the soluble organic fraction of the PM (SOF), aldehydes and ketones (ALD), ethanol (ETH), individual hydrocarbons (IHC), polycyclic aromatic hydrocarbons (PAH), and 1-nitropyrene. A detailed listing of the analyses performed is given in Table 9.

For each mode, SOF was determined by extracting a 50 percent section of the particulate-laden 90mm Pallflex filters using a Soxhlet apparatus with toluene-ethanol solvent. Solvent is evaporated from the extracted particulate filters and the filters are re-weighed. The difference in mass is the solvent-extractable material.

Individual hydrocarbons were measured from proportional bag samples of dilute exhaust for each mode using gas chromatography. Compounds ranging from C1 to C12, are identified and quantified in a process that requires four separate chromatographs. The process is based on the Auto/Oil Phase II Hydrocarbon Speciation procedure. Full hydrocarbon speciation includes analysis of aldehydes, ketones, and alcohols if oxygenates are present in the fuel.

Aldehydes and ketones (collectively known as carbonyl compounds) were sampled from the dilute exhaust for each mode utilizing impingers containing a solution of dinitrophenylhydrazine (DNPH) in acetonitrile. The highly reactive carbonyl compounds form stable derivatives with DNPH, which absorb ultra-violet light energy at specific wavelengths. These samples were analyzed using a high-pressure liquid chromatograph (HPLC) instrument.

Ethanol samples were collected for each mode utilizing impingers containing pure water. An aliquot was subsequently analyzed using gas chromatography with flame ionization detection (GC-FID).

The PAH-plus are distributed in both the particulate and the gaseous phase of the dilute exhaust, and are difficult to measure at low concentrations. Additionally, there was concern that the sampling system has a “memory” for some PAH-plus; therefore, additional effort to condition the sampling system with exhaust from the fuel under test was desirable. To accommodate these concerns, only after routing exhaust from several practice runs and preparatory operations through the constant volume sampler (CVS), was dilute engine exhaust sampling for a selected baseline test performed for record, using one composite sample for the entire 8-mode test. The composite sample approach increased the level of complexity of the sampling system but gave an almost eightfold analytical sensitivity and analysis cost benefit. During each five-minute engine stabilization period at the beginning of each mode prior to emission sampling, the dilute exhaust sample flow going to the PAH-plus samples was diverted, in order to protect the integrity of the 8-mode sample.

The dilute exhaust sampling process for PAH-plus is described as follows. For the particulate-phase sampling, a single 20×20-inch Pallflex filter was used to collect particulate-phase PAH-plus for the whole duration of each 8-mode test. Another filter was then used for the “blank” sampling, during which only the dilution tunnel was turned on (no engine operation). It was operated for the same duration as the entire 8-mode test.

Similarly, for the gas-phase PAH-plus collection, a set of four PUF/XAD-2 traps was run in parallel over the full, 8-mode sequence to accumulate gas-phase PAH-plus compounds. Four parallel traps were required to give sufficient gas flow (sample size) for meaningful detection limits. The PUF/XAD-2 trap set was extracted to generate a separate sample for the gas-phase PAH-plus analysis.

Only the samples from one of each duplicate, 8-mode test (particulate- and gas-phase) were processed for final analysis of the PAH-plus emissions. The samples from the second 8-mode test were extracted and stored as a backup. Subsequent to each 8-mode test, a "blank" sample, using a period of time similar to that used to accumulate dilute exhaust samples, was taken.

TABLE 9. LIST OF UNREGULATED EMISSIONS MEASURED

Compound	Abbreviation
Soluble Organic Fraction of PM	(SOF)
Aldehydes and Ketones Formaldehyde Acetaldehyde Acrolein Propionaldehyde Methyl ethyl ketone	(ALD)
Ethanol	(ETH)
Individual Hydrocarbons 1,3-Butadiene Methane Benzene Toluene Ethylbenzene m- & p-Xylene (reported together) o-Xylene Hexane Styrene	(IHC)
Individual PAH Naphthalene Acenaphthene Acenaphthylene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene	(PAH)
1-Nitropyrene	

IV. RESULTS

A. 8.1-Liter Engine Results

A summary of averaged, composite values for the duplicate, 8-mode tests of the 8.1-L engine operating on each fuel are presented in Table 10 and in Figure 1. Additional conventional 8-mode tests without unregulated emissions measurement were performed, and are reported as “baseline fuel/short.”

Carbon balance fuel consumption (C-B FC) is computed from the emissions data, while observed fuel consumption (OBS. FC) is derived from integrated measurement of flow and calculated work. Both are weighted average brake specific expressions.

Smoke test results are presented in Figure 2 and soluble organic fraction of particulate matter is summarized in Table 11. Individual hydrocarbon emissions results are summarized in Tables 12, with PAH and n-PAH results presented in Table 13. Detailed results for individual tests of the 8.1-L engine are presented in Appendix B.

Emissions of hydrocarbons generally increased with the ethanol blends. The highest result, however, was observed with the 7.7 percent blend and dropped off with increasing ethanol content, to being slightly less than the baseline result for the 15 percent blend. Carbon monoxide and particulate emissions showed a definite reduction in line with increasing ethanol content. Emissions of NO_x were unchanged for the 7.7 percent blend, but increased for the 10 and 15 percent blends.

**TABLE 10. REGULATED EMISSIONS SUMMARY FOR 8.1-LITER ENGINE
AVERAGED, COMPOSITE RESULTS OVER 8-MODE TEST**

TEST NUMBER	81-4970	81-4929	81-4936	81-4951	81-4970
FUEL TYPE	BASELINE FUEL	7.7% ETHANOL	10% ETHANOL	15% ETHANOL	BASELINE FUEL/SHORT
HC, g/bhp-hr	0.195	0.235	0.220	0.190	0.196
CO, g/bhp-hr	0.490	0.460	0.430	0.420	0.491
NO _x , g/bhp-hr	4.52	4.52	4.58	4.62	4.43
Particulate, g/bhp-hr	0.076	0.064	0.063	0.053	0.082
CO ₂ , g/bhp-hr	503	497	501	503	501
C-B FC, lb/bhp-hr	0.35	0.36	0.36	0.37	0.35
OBS. FC, lb/bhp-hr	0.34	0.35	0.35	0.37	0.35

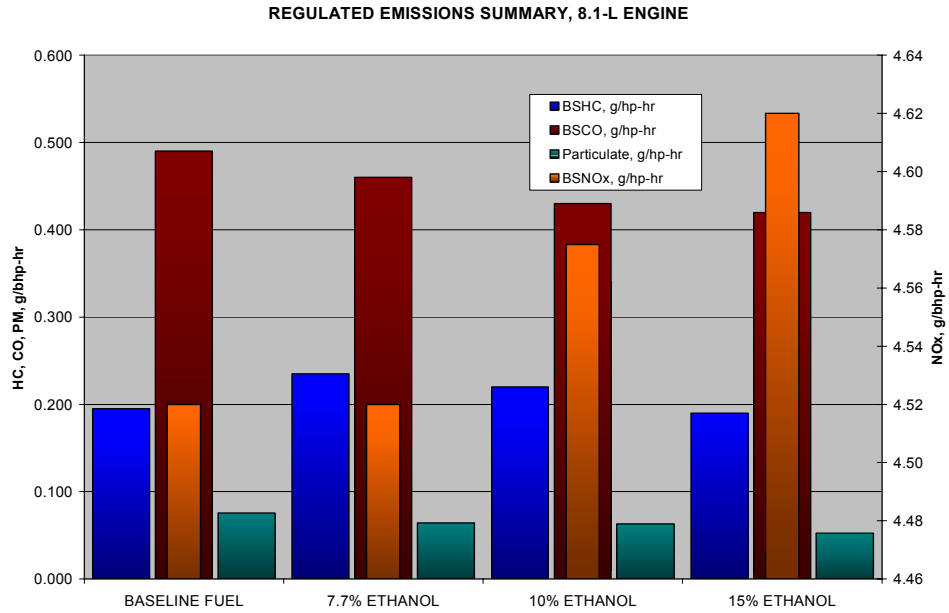


FIGURE 1. REGULATED EMISSIONS SUMMARY FOR 8.1-L ENGINE

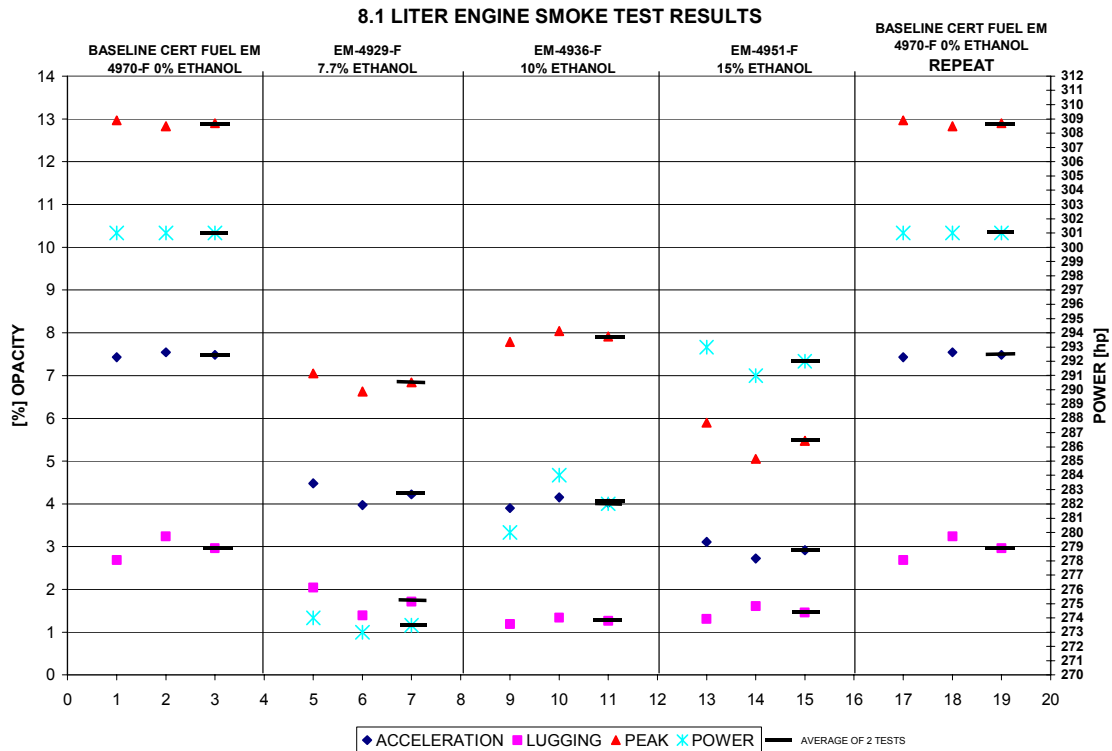


FIGURE 2. SMOKE TEST RESULTS FOR 8.1-L ENGINE

**TABLE 11. SOLUBLE ORGANIC FRACTION BY MODE FOR 8.1-L-ENGINE
PERCENT OF TOTAL PARTICULATE MATTER**

TEST ID	81-4970		81-4929		81-4936		81-4951	
FUEL TYPE	BASELINE FUEL		7.7% ETHANOL		10% ETHANOL		15% ETHANOL	
Replicate	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Mode 1	41.7	39.3	58.7	53.9	59.9	56.5	58.6	57.3
Mode 2	38.5	33.3	53.2	44.4	38.8	44.0	49.6	47.5
Mode 3	45.3	31.0	37.8	42.5	35.6	43.1	44.3	33.6
Mode 4	85.7	91.1	91.6	84.3	84.8	90.3	93.0	>99.0
Mode 5	31.6	35.6	43.6	35.8	36.1	38.1	48.1	42.1
Mode 6	34.0	27.5	42.4	45.8	34.6	42.1	49.8	49.2
Mode 7	49.7	43.7	70.5	62.4	50.8	46.7	70.1	65.3
Mode 8	92.9	82.9	96.6	90.6	82.6	83.2	93.6	86.4

**TABLE 12. UNREGULATED EMISSIONS SUMMARY FOR 8.1-LITER ENGINE
AVERAGED, COMPOSITE RESULTS OVER 8-MODE TEST, mg/hp-hr**

TEST ID	81-4970	81-4929	81-4936	81-4951
FUEL TYPE	BASELINE FUEL	7.7% ETHANOL	10% ETHANOL	15% ETHANOL
FORMALDEHYDE	9.56	10.21	10.52	11.00
ACETALDEHYDE	3.70	4.71	4.68	5.51
ACROLEIN	1.87	1.83	1.43	1.59
PROPIONALDEHYDE	0.68	0.83	1.18	1.22
METHYL ETHYL KETONE	0.53	0.59	0.09	0.09
ETHANOL	0.32	16.58	17.65	26.89
1,3-BUTADIENE	0.90	0.92	0.68	0.68
METHANE	2.09	0.32	0.53	0.15
BENZENE	0.81	0.70	0.69	0.72
TOLUENE	1.00	1.61	0.90	1.17
ETHYLBENZENE	0.51	0.53	0.42	0.55
m- & p-XYLENE	0.85	0.74	0.61	0.89
o-XYLENE	0.39	0.34	0.38	0.43
HEXANE	0.03	0.11	0.07	0.16
STYRENE	0.12	0.07	0.11	0.10

**TABLE 13. PAH-PLUS COMPOUNDS FOR 8.1-L ENGINE,
COMPOSITE RESULTS OVER 8-MODE TEST, ng/hp-hr**

TEST ID	8.1-4970		8.1-4929		8.1-4936		8.1-4951	
FUEL TYPE	BASELINE FUEL		7.7 % ETHANOL		10 % ETHANOL		15 % ETHANOL	
COMPOUND/PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE
Naphthalene	224515	237	234480	84	472781	144	219800	95
Acenaphthylene	1244	146	271	72	277	97	49	62
Acenaphthene	30207	89	30172	51	35886	63	30678	41
Fluorene	59566	471	47348	207	56904	295	45485	162
Phenanthrene	99538	7419	91207	3428	103191	4084	76198	2244
Anthracene	6519	710	6443	331	6842	368	5123	208
Fluoranthene	2274	2390	2935	348	3266	1627	2657	919
Pyrene	3674	5146	6413	3741	6267	3959	5685	2493
Benzo(a)anthracene	7	358	16	428	13	403	17	275
Chrysene	16	834	30	830	30	877	35	617
Benzo(b)fluoranthene	2	145	1	179	2	183	1	160
Benzo(k)fluoranthene	2	84	1	155	1	126	0	125
Benzo(a)pyrene	1	87	0	171	1	136	0	111
Indeno(1,2,3-cd)pyrene	1	14	1	27	1	32	1	34
Dibenzo(a,h)anthracene	2	5	0	8	0	10	0	8
1-Nitropyrene	0	129	1	68	1	90	2	79

Results of the PAH-plus analyses have been presented graphically in Figures 3 through 8. Figure 3 illustrates the total of particulate- and vapor-phase compounds together. Figure 4 shows the compounds separated by phase. These two plots illustrate the range of PAH-plus in the exhaust. In Figure 5, presentation of a subgroup of the lighter molecular weight compounds for the vapor phase only is made. In this vapor phase, acenaphthylene and fluorene are lower for the alcohol blends, but fluoranthene and pyrene are higher. Naphthalene has been omitted to allow the plot of other compounds to be on a more informative scale. Figure 6 is a view of a subgroup of the heavier molecular weight compounds for only the vapor phase. An increasing trend with alcohol content is observable for benzo(a)anthracene and chrysene in this view. Lighter molecular weight compounds for the particulate-phase only are shown in Figure 7, where all compounds are lower in the ethanol blends than in the baseline diesel. Figure 8 shows the heavier molecular weight compounds for the particulate-phase only. Benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a) pyrene, indeno(1,2,3-cd)pyrene, and dibenzo(a,h)anthracene are all higher for the ethanol blends, but 1-nitropyrene is lower.

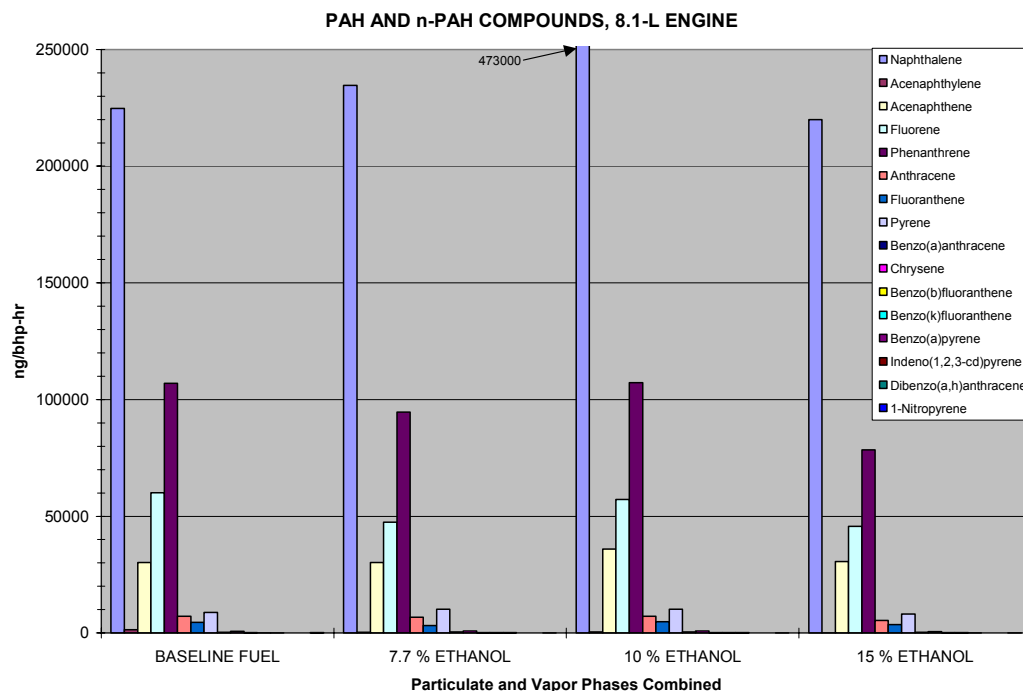


FIGURE 3. COMBINED PARTICULATE- AND VAPOR-PHASE PAH COMPOUNDS, 8.1-L ENGINE

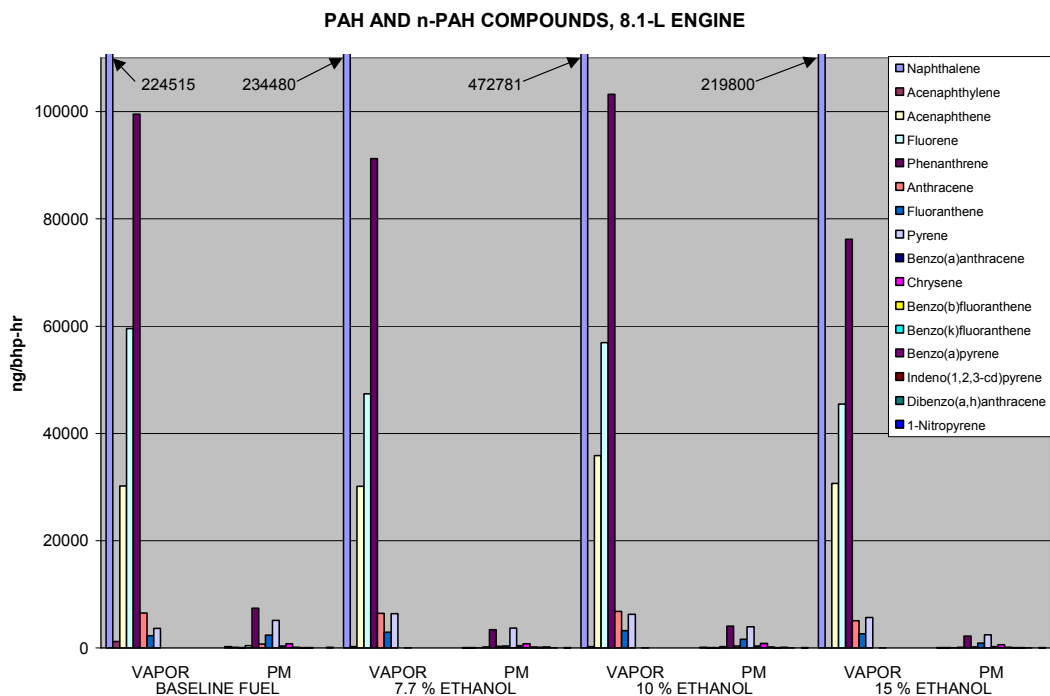


FIGURE 4. PAH COMPOUNDS BY PHASE, 8.1-L ENGINE

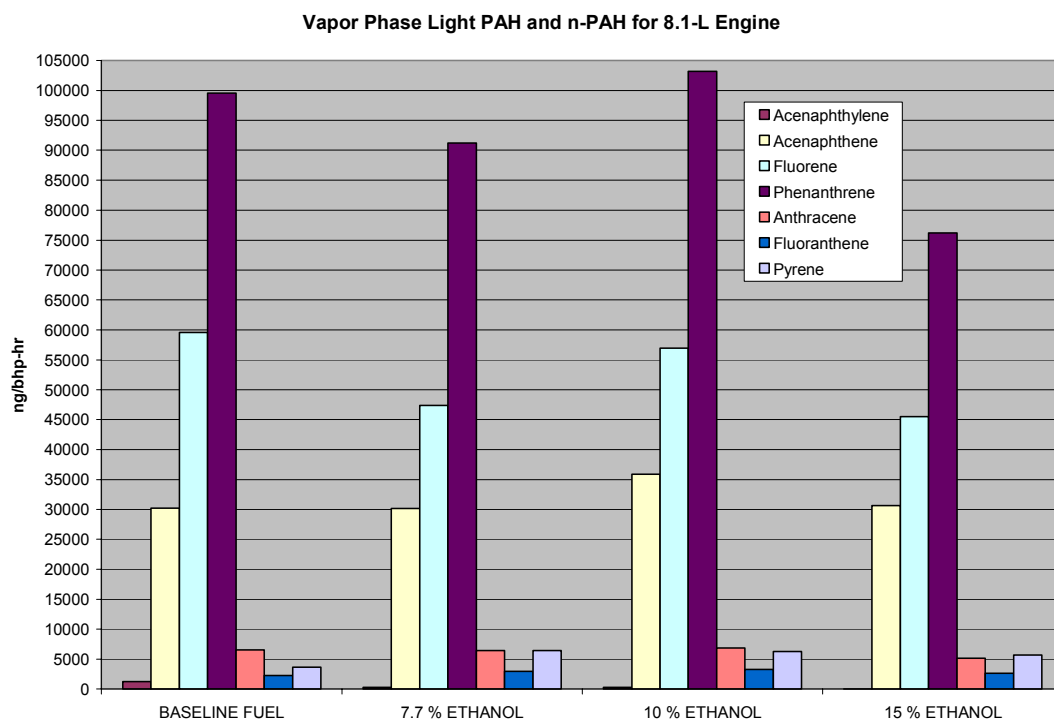


FIGURE 5. LIGHTER PAH-PLUS COMPOUNDS, VAPOR PHASE ONLY, 8.1-L ENGINE

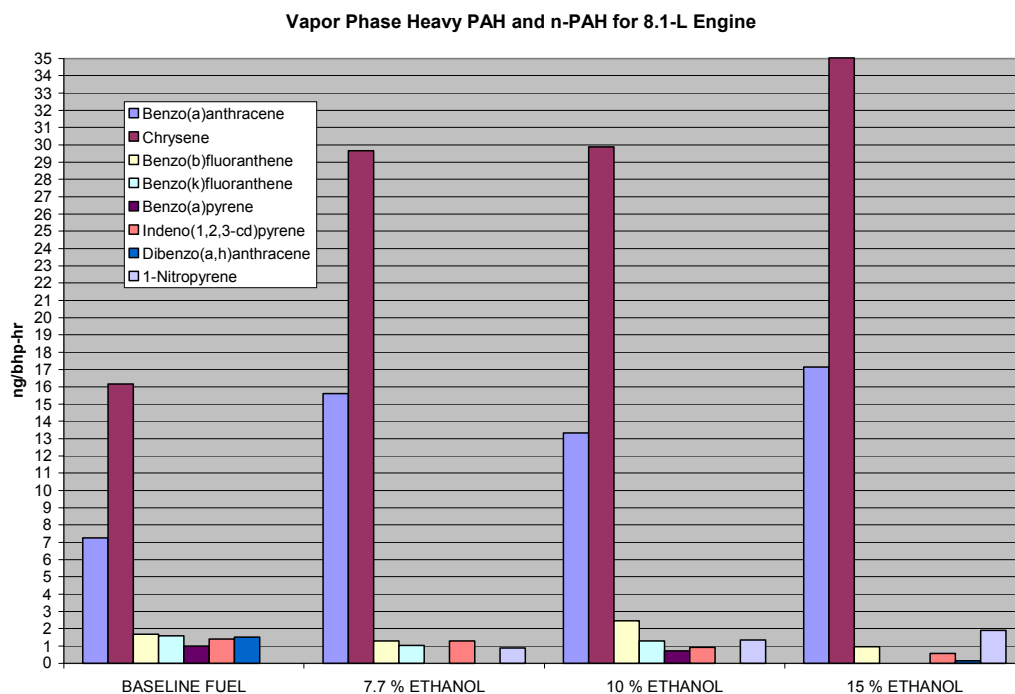


FIGURE 6. HEAVIER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS, VAPOR PHASE ONLY, 8.1-L ENGINE

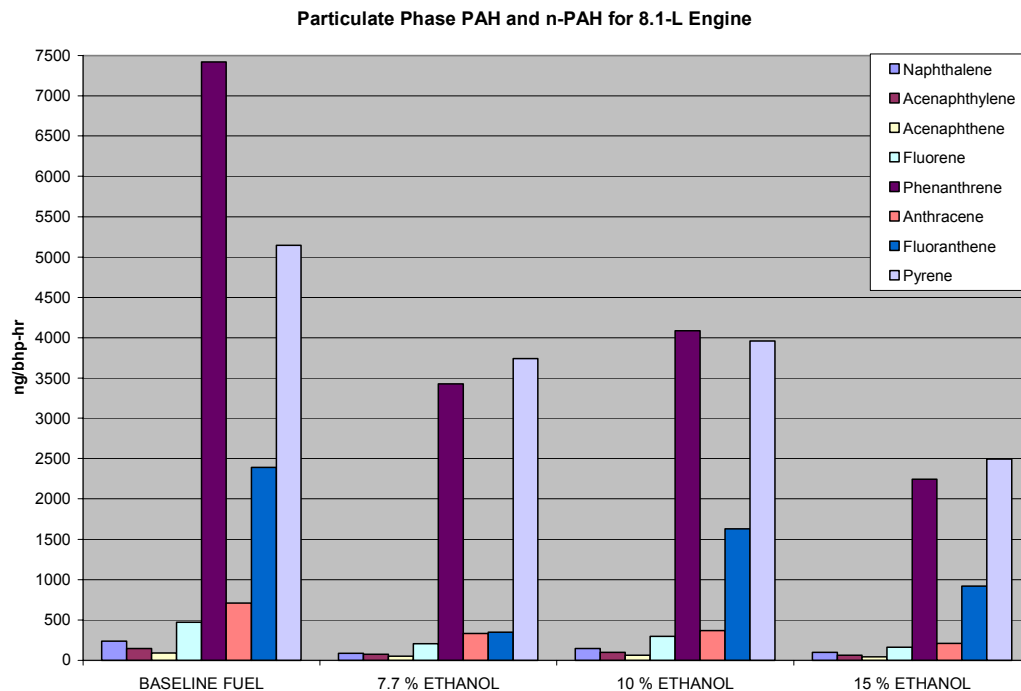


FIGURE 7. LIGHTER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS, PARTICULATE PHASE ONLY, 8.1-L ENGINE

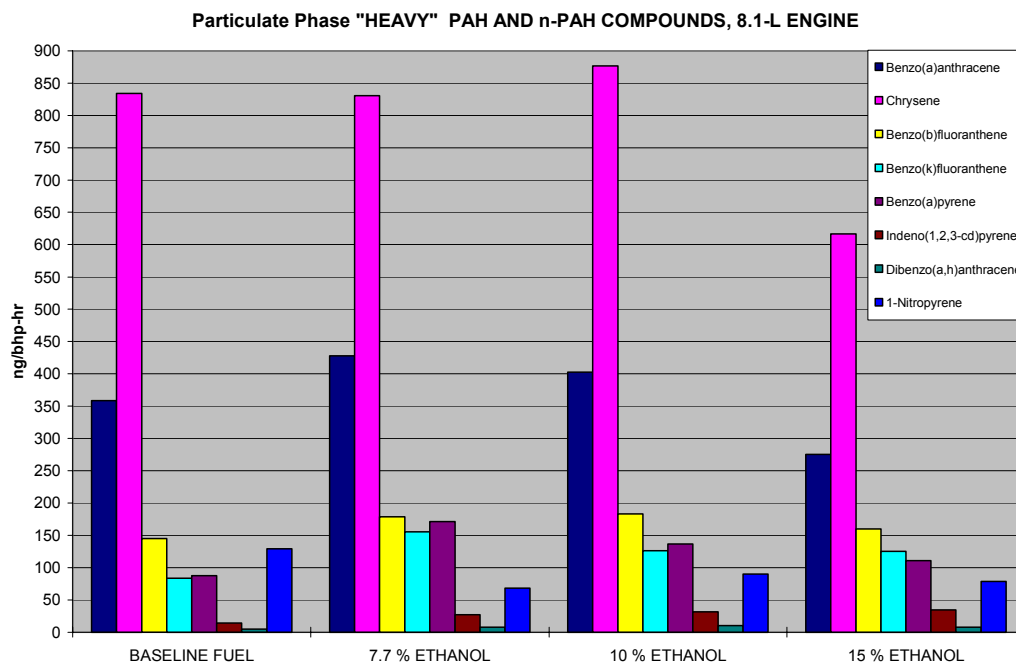


FIGURE 8. HEAVIER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS, PARTICULATE PHASE ONLY, 8.1-L ENGINE

B. 6.8-Liter Engine Results

A summary of averaged, composite values for the duplicate, 8-mode tests of the 6.8-L engine operating on each fuel are presented in Table 14 and in Figure 9. Additional conventional 8-mode tests without unregulated emissions measurement were performed, and are reported as “baseline fuel/short.”

Carbon balance fuel consumption (C-B FC) is computed from the emissions data, while observed fuel consumption (OBS. FC) is derived from integrated measurement of fuel flow and calculated work. Both are weighted average brake specific expressions.

Smoke test results are presented in Figure 10 and soluble organic fraction of particulate matter is summarized in Table 15. Individual hydrocarbon emissions results are summarized in Tables 16, with PAH-plus results presented in Table 17. Detailed results for individual tests of the 6.8-L engine are presented in Appendix C.

For the 6.8-L engine, there was no observable trend for hydrocarbon emissions. Carbon monoxide emissions increased with increasing ethanol content, and particulate emissions showed the opposite trend. Emissions of oxides of nitrogen were reduced with the ethanol-blended fuels, but were relatively constant regardless of ethanol content.

**TABLE 14. REGULATED EMISSIONS SUMMARY FOR 6.8-LITER ENGINE
AVERAGED, COMPOSITE RESULTS OVER 8-MODE TEST**

TEST NUMBER	68-4970	68-4930	68-4937	68-4949	68-4970
FUEL TYP	BASELINE FUEL	7.7% ETHANOL	10% ETHANOL	15% ETHANOL	BASELINE FUEL SHORT
HC, g/bhp-hr	0.35	0.34	0.34	0.38	0.33
CO, g/bhp-hr	0.62	0.64	0.68	0.76	0.60
NO _x , g/bhp-hr	3.95	3.60	3.59	3.62	3.84
Particulate, g/bhp-hr	0.159	0.153	0.145	0.124	0.169
CO ₂ , g/bhp-hr	526	518	526	522	516
C-B FC, lb/bhp-hr	0.37	0.37	0.38	0.38	0.38
OBS. FC, lb/bhp-hr	0.35	0.36	0.36	0.36	0.34

REGULATED EMISSIONS SUMMARY, 6.8-L ENGINE

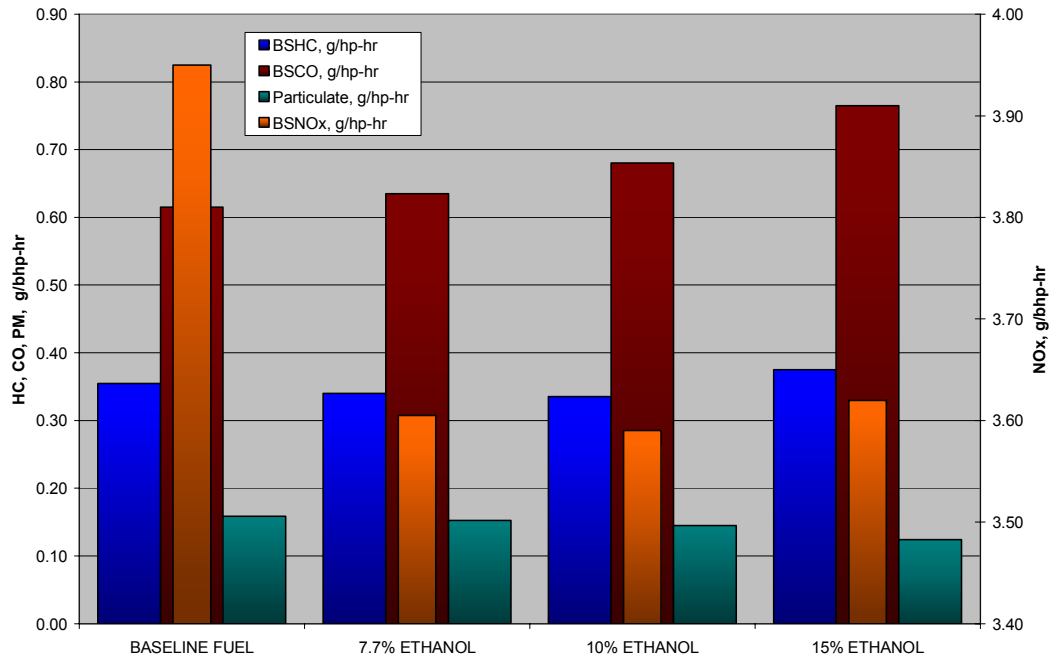


FIGURE 9. REGULATED EMISSION SUMMARY, 6.8-L ENGINE

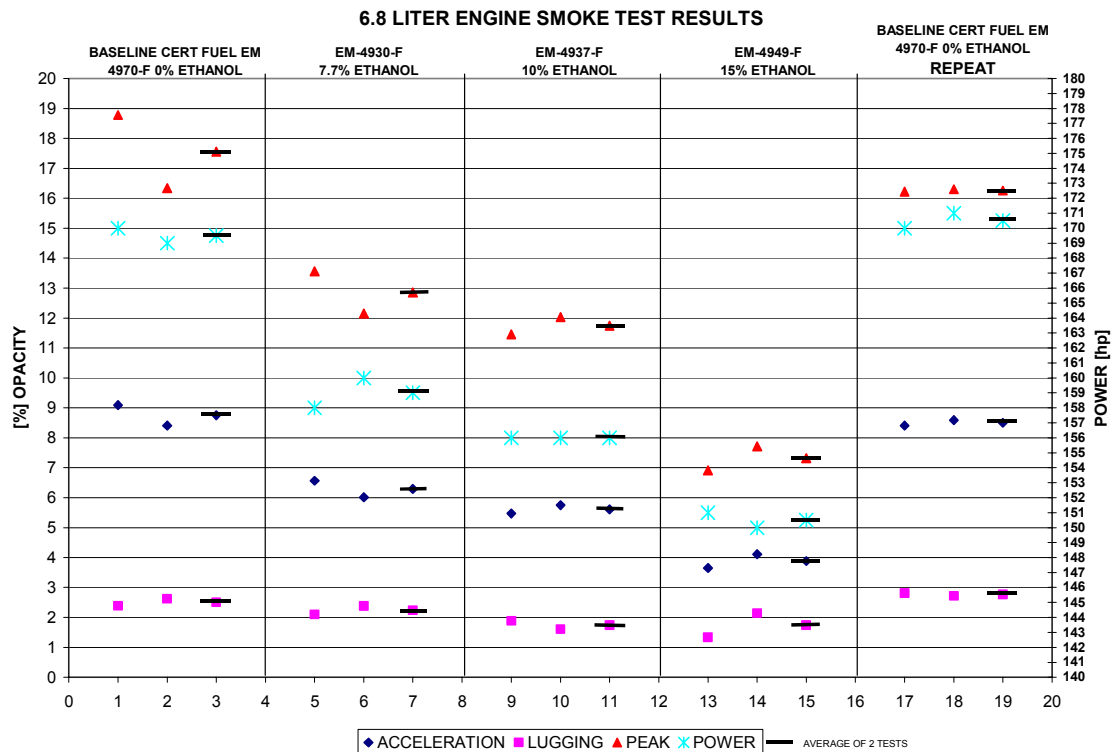


FIGURE 10. SMOKE TEST RESULTS FOR 6.8-L ENGINE

**TABLE 15. SOLUBLE ORGANIC FRACTION BY MODE FOR 6.8-L ENGINE
PERCENT OF TOTAL PARTICULATE MATTER**

TEST ID	68-4970		68-4930		68-4937		68-4949	
FUEL TYPE	BASELINE FUEL		7.7% ETHANOL		10% ETHANOL		15% ETHANOL	
Replicate	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Mode 1	12.8	16.6	11.4	12.7	11.7	13.8	15.3	12.4
Mode 2	22.1	21.4	26.6	23.5	19.5	26.5	36.3	33.0
Mode 3	50.1	48.9	53.9	66.0	49.6	61.8	73.8	63.0
Mode 4	78.9	83.5	84.8	80.4	75.8	84.3	83.4	88.5
Mode 5	6.8	11.7	10.9	9.3	8.5	11.8	14.7	14.4
Mode 6	28.7	21.8	26.5	22.2	29.9	27.2	34.1	33.2
Mode 7	46.5	48.8	60.5	48.4	58.7	60.1	58.3	62.2
Mode 8	91.4	85.9	61.3	75.2	92.8	88.2	67.9	>99.0

**TABLE 16. UNREGULATED EMISSIONS SUMMARY FOR 6.8-LITER ENGINE
AVERAGED, COMPOSITE RESULTS OVER 8-MODE TEST, mg/hp-hr**

TEST ID	68-4970	68-4930	68-4937	68-4949
COMPOUND/FUEL TYPE	BASELINE FUEL	7.7% ETHANOL	10% ETHANOL	15% ETHANOL
FORMALDEHYDE	16.56	14.77	14.88	20.11
ACETALDEHYDE	4.82	6.27	7.56	10.82
ACROLEIN	2.04	0.47	0.75	2.68
PROPIONALDEHYDE	2.35	1.32	1.39	1.81
METHYL ETHYL KETONE	0.15	0.13	0.30	0.16
ETHANOL	0.44	23.22	32.82	52.66
1,3-BUTADIENE	1.70	1.40	0.56	1.03
METHANE	0.71	1.14	2.37	3.11
BENZENE	1.78	1.68	1.79	1.82
TOLUENE	3.05	0.84	1.80	1.83
ETHYLBENZENE	0.90	0.68	0.51	0.76
m- & p-XYLENE	1.36	0.97	0.95	2.08
o-XYLENE	0.63	0.50	0.60	1.50
HEXANE	0.11	0.26	0.36	0.48
STYRENE	0.26	0.18	0.11	0.19

**TABLE 17. PAH-PLUS COMPOUNDS FOR 6.8-L ENGINE,
COMPOSITE RESULTS OVER 8-MODE TEST, ng/hp-hr**

TEST ID	68-4970		68-4930		68-4937		68-4949	
FUEL TYPE	BASELINE FUEL		7.7% ETHANOL		10% ETHANOL		15% ETHANOL	
COMPOUND/PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE
Naphthalene	390119	408	108331	371	245566	299	381781	161
Acenaphthylene	34922	154	16425	162	36284	117	40979	95
Acenaphthene	34574	163	21906	114	53332	95	33762	46
Fluorene	64597	335	48300	323	65698	248	54219	324
Phenanthrene	147670	11876	75958	9180	102103	8572	75822	5694
Anthracene	9506	1374	4698	1128	6717	1011	9531	613
Fluoranthene	1735	4467	1950	4988	2281	4481	5203	2984
Pyrene	1591	8429	2567	12128	4212	12127	8128	6239
Benzo(a)anthracene	5	365	0	487	0	456	2	545
Chrysene	7	1243	8	1307	6	1263	7	1513
Benzo(b)fluoranthene	0	77	0	117	0	103	0	233
Benzo(k)fluoranthene	0	105	0	117	0	119	0	174
Benzo(a)pyrene	0	39	0	94	0	81	0	151
Indeno(1,2,3-cd)pyrene	0	10	0	11	0	10	0	27
Dibenzo(a,h)anthracene	0	4	0	6	0	6	0	12
1-Nitropyrene	0	276	0	105	2	118	0	103

Results of the PAH-plus analyses have been presented graphically in Figures 11 through 15. Figure 11 illustrates the total of particulate- and vapor-phase compounds together. Figure 12 shows the compounds separated by phase. In Figure 13, presentation of a subgroup of the lighter molecular weight compounds for the vapor phase only is made. Phenanthrene and anthracene are lower for the alcohol blends, but fluoranthene and pyrene are higher. Figure 14 shows the lighter molecular weight compounds for the particulate phase only, where most compounds are lower in the ethanol blends. Figure 15 shows the heavier molecular weight compounds for the particulate phase. All compounds except 1-nitropyrene are higher in the ethanol blends. Lower emission rates are seen for 1-nitropyrene with the ethanol blends.

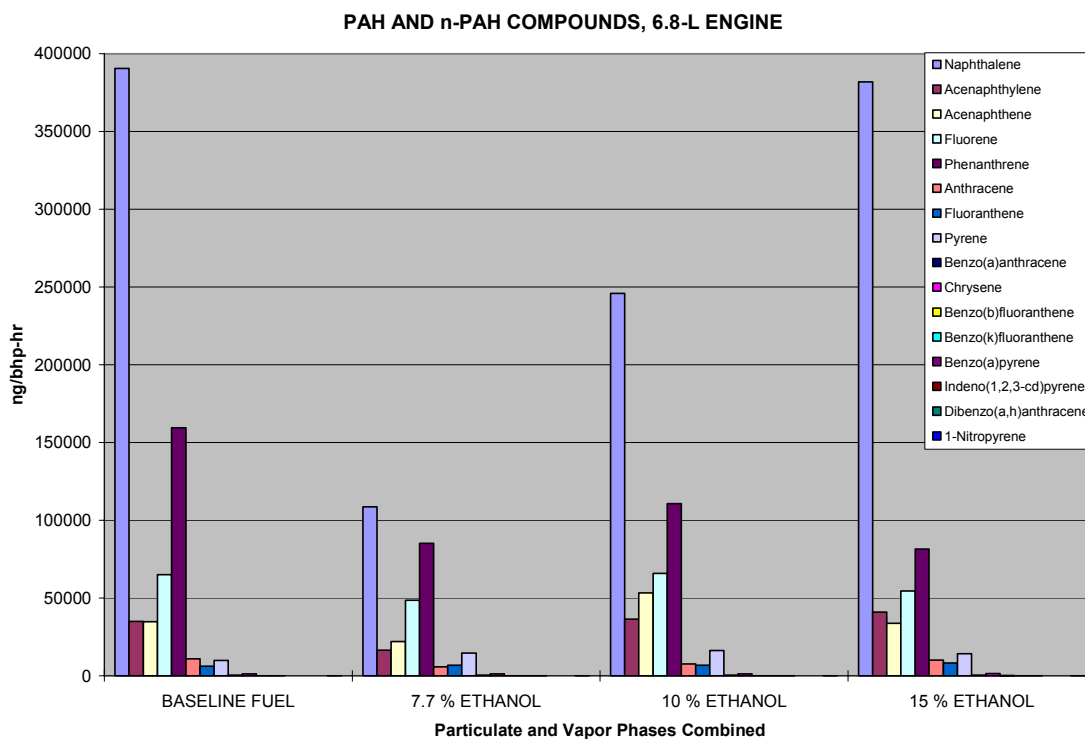


FIGURE 11. COMBINED PARTICULATE- AND VAPOR-PHASE PAH-PLUS COMPOUNDS, 6.8-L ENGINE

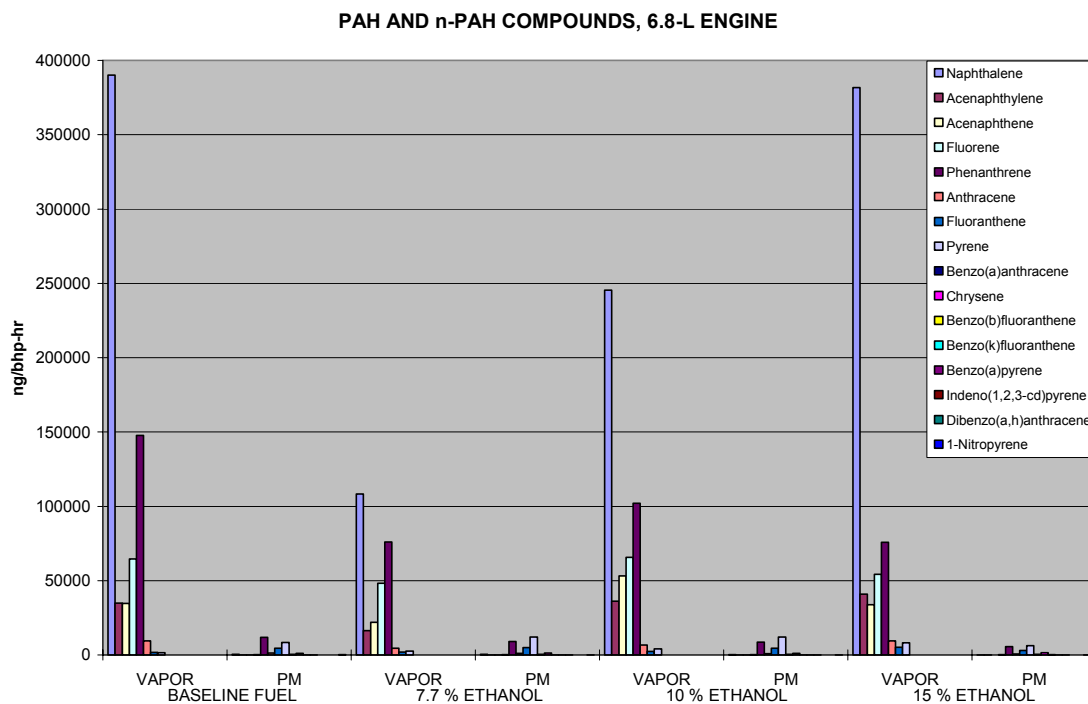


FIGURE 12. PAH-PLUS COMPOUNDS BY PHASE, 6.8-L ENGINE

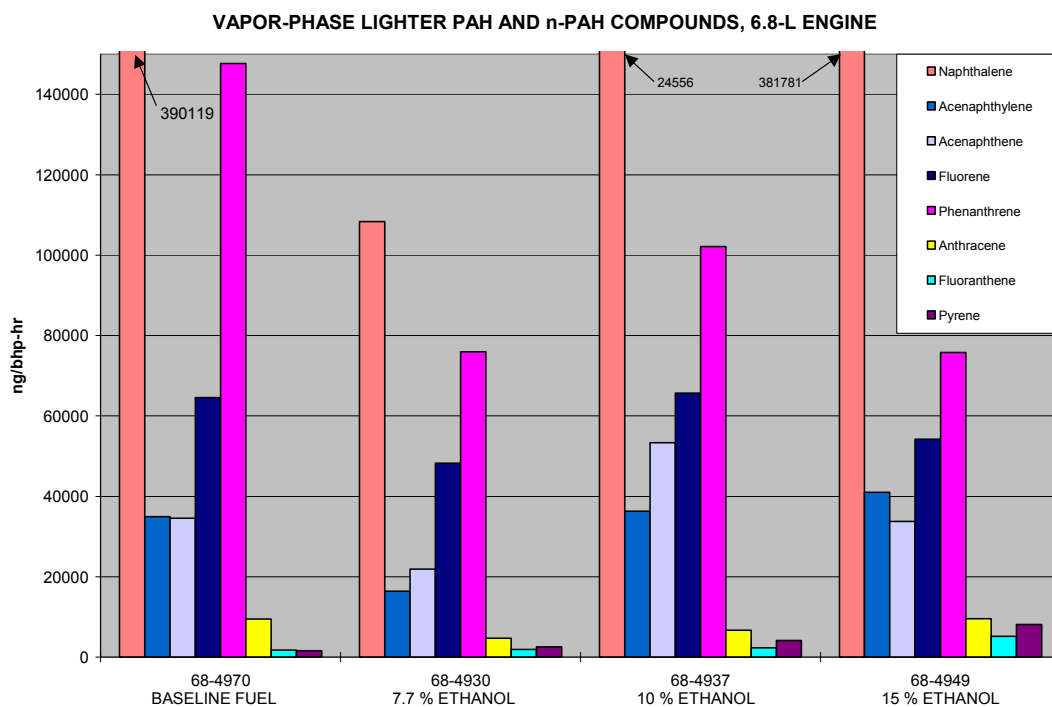


FIGURE 13. LIGHTER MOLECULAR WEIGHT PAH COMPOUNDS, VAPOR PHASE ONLY, 6.8-L ENGINE

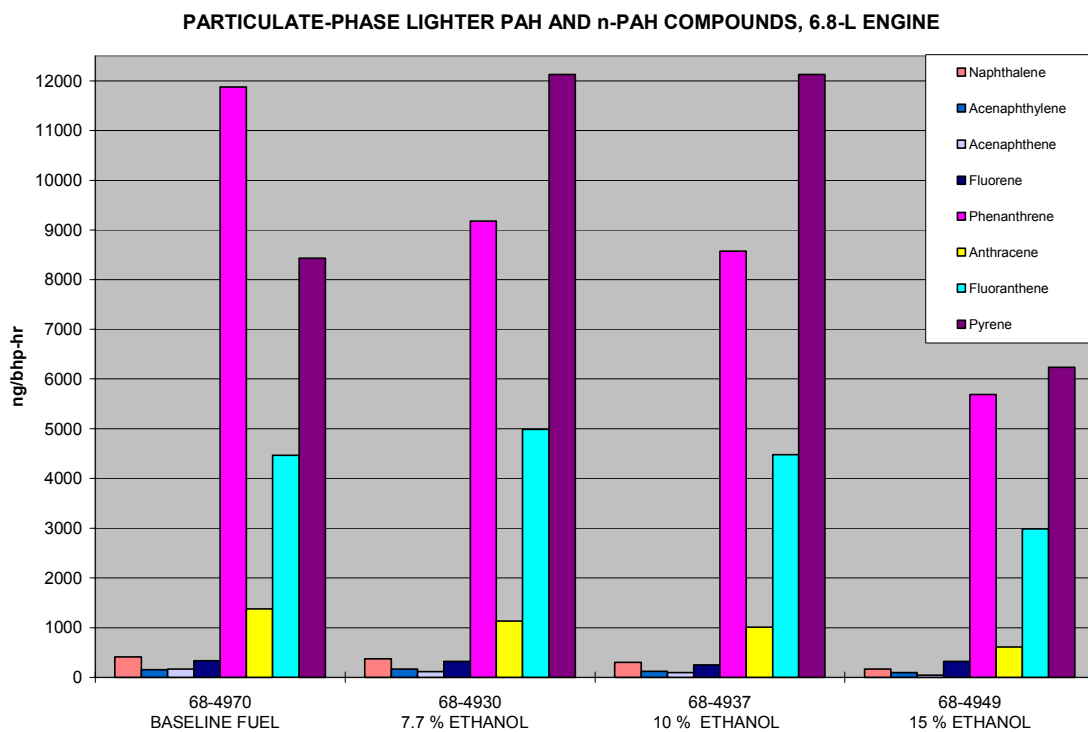
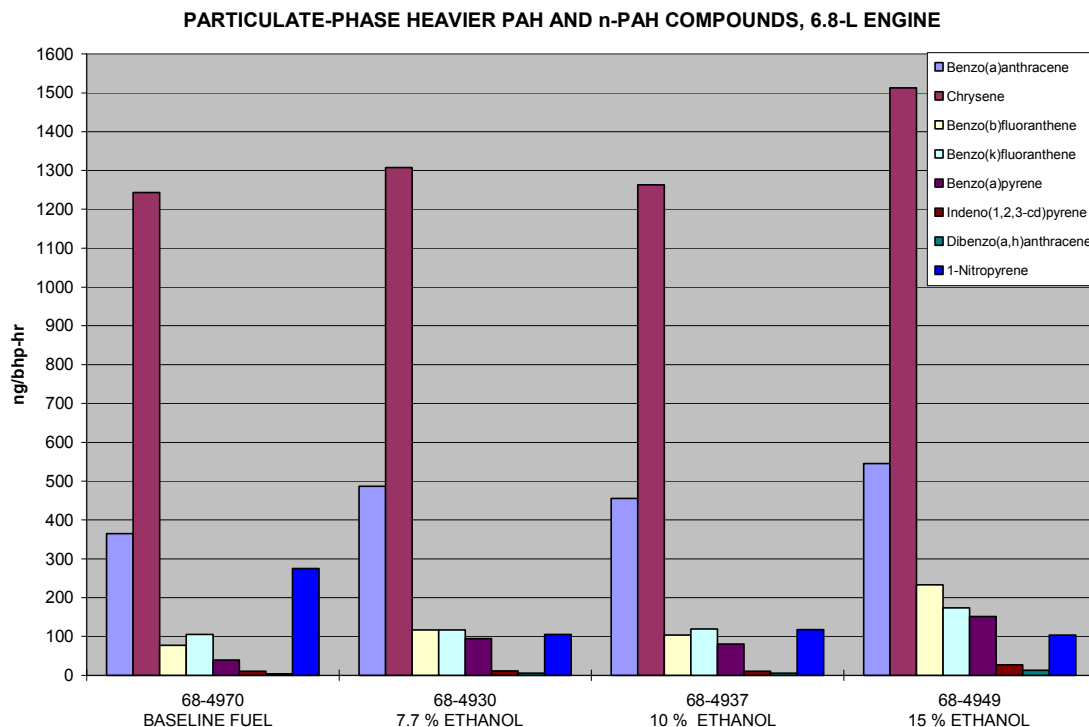


FIGURE 14. LIGHTER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS, PARTICULATE PHASE ONLY, 6.8-L ENGINE



**FIGURE 15. HEAVIER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS,
PARTICULATE PHASE ONLY, 6.8-L ENGINE**

C. 12.5-Liter Engine Results

Power output of this engine was consistent with the manufacturer's ratings when operating on straight diesel fuel, but problems were experienced when first operating the 12.5-L engine with ethanol-blended fuel. After a period of operation on ethanol-blended fuel, the power output would drop-off. The engine was extensively diagnosed and after finding nothing wrong, a new ECU was installed. This modification did not alter its behavior on the ethanol-blended fuel. It was determined that the performance problems were caused by the ethanol-blended fuel boiling, because the boiling point of the ethanol-blended fuel is so much lower than base diesel fuel. The fuel is routed through the head on this engine design, as is common practice with unit injection. In addition, a portion of the unused fuel is re-circulated through the head, rather than being returned to the fuel tank. It is likely that the fuel became too hot and began to boil while passing through the head. A small cooler was installed to reduce the fuel temperature prior to reaching the injectors. After this modification was installed, the engine performed well, and testing proceeded without incident.

A summary of averaged, composite values for the duplicate, 8-mode tests of the 12.5-L engine operating on each fuel are presented in Table 18 and Figure 16. Additional conventional 8-mode tests without unregulated emissions measurement were performed, and are reported as “baseline fuel/short.”

Carbon balance fuel consumption (C-B FC) is computed from the emissions data, while observed fuel consumption (OBS FC) is derived from integrated measurement of fuel flow and calculated work. Both are weighted average brake specific expressions.

Smoke test results are presented in Figure 17 and soluble organic fraction of particulate matter is summarized in Table 19. Individual hydrocarbon emissions results are summarized in Tables 20, with PAH-plus results presented in Table 21. Detailed results for individual tests of the 12.5-L engine are presented in Appendix D.

**TABLE 18. REGULATED EMISSIONS SUMMARY FOR 12.5-LITER ENGINE
AVERAGED, COMPOSITE RESULTS**

TEST NUMBER	125-4970	125-4932	125-4935	125-4950	125-4970
FUEL TYPE	BASELINE FUEL	7.7% ETHANOL	10% ETHANOL	15% ETHANOL	BASELINE FUEL SHORT
HC, g/bhp-hr	0.215	0.245	0.260	0.255	0.210
CO, g/bhp-hr	0.420	0.355	0.355	0.360	0.430
NO _x , g/bhp-hr	4.03	3.86	3.81	3.83	4.03
Particulate, g/bhp-hr	0.085	0.074	0.072	0.069	0.091
CO ₂ , g/bhp-hr	491	495	494	492	495
C-B FC, lb/bhp-hr	0.34	0.35	0.35	0.36	0.34
OBS. F-C, lb/bhp-hr	0.34	0.34	0.34	0.35	0.33

12.5-L Engine Regulated Emissions Summary

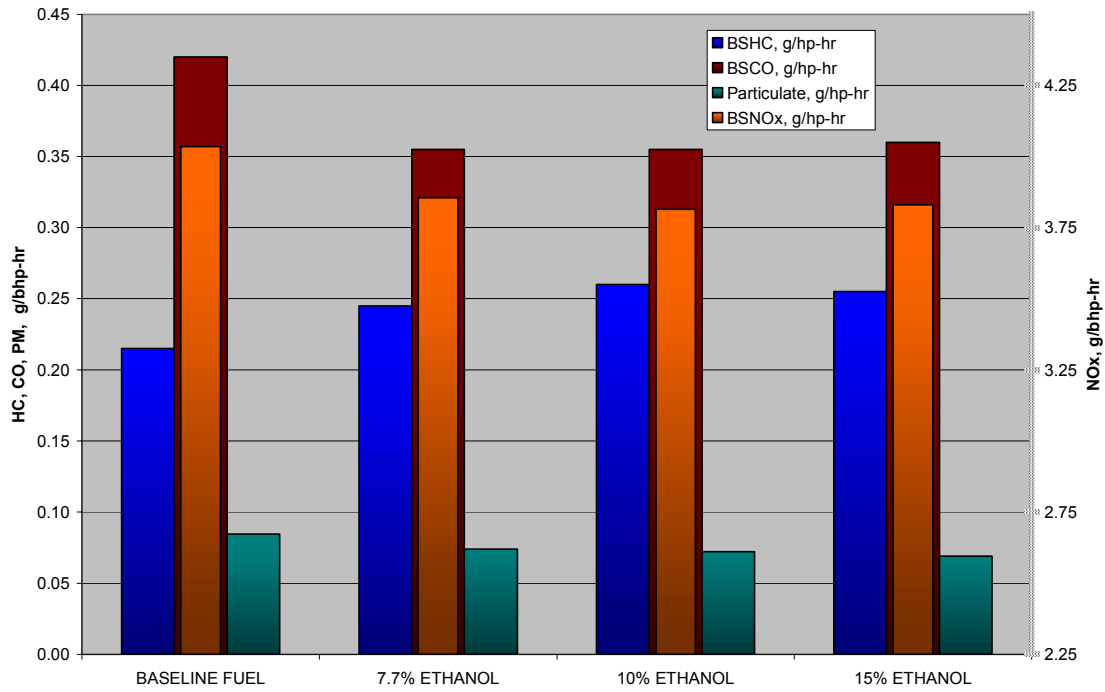


FIGURE 16. REGULATED EMISSIONS SUMMARY, 12.5-L ENGINE

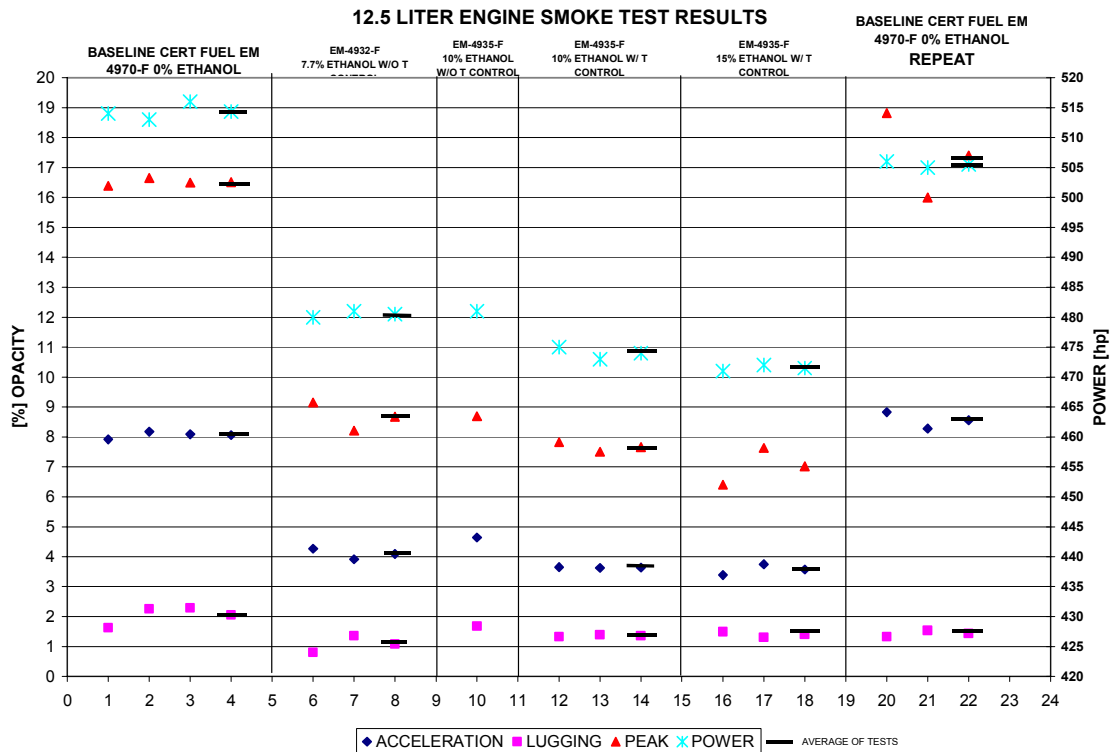


FIGURE 17. SMOKE TEST RESULTS FOR 12.5-L ENGINE

**TABLE 19. SOLUBLE ORGANIC FRACTION BY MODE FOR 12.5-L ENGINE
PERCENT OF TOTAL PARTICULATE MATTER**

12.5-LITER Engine								
Test ID	125-4970		125-4932		125-4935		125-4950	
Fuel Type	BASELINE FUEL		7.7% ETHANOL		10% ETHANOL		15% ETHANOL	
Replicate	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Mode 1	63.2	51.8	54.8	63.2	65.7	52.0	65.3	65.8
Mode 2	49.1	41.1	59.7	49.1	55.6	58.7	67.5	61.4
Mode 3	40.9		44.9	40.9	40.7	44.6	44.9	37.9
Mode 4	44.4	32.0	44.6	44.4	42.0	42.2	49.7	47.8
Mode 5	74.6	68.0	67.7	74.6	65.6	68.8	85.4	62.0
Mode 6	80.1	58.0	82.2	80.1	70.3	73.5	100	69.2
Mode 7	63.2	65.7	72.4	63.2	69.0	56.7	56.4	62.4
Mode 8	100	100	100	100	100	100	100	98.0

**TABLE 20. UNREGULATED EMISSIONS SUMMARY FOR 12.5-LITER ENGINE
AVERAGED, COMPOSITE RESULTS OVER 8-MODE TEST, mg/hp-hr**

TEST ID	125-4970	125-4932	125-4935	125-4950
FUEL TYPE	BASELINE FUEL	7.7% ETHANOL	10% ETHANOL	15% ETHANOL
FORMALDEHYDE	9.16	10.50	11.04	11.78
ACETALDEHYDE	2.78	4.60	5.23	6.65
ACROLEIN	1.05	1.23	0.97	1.25
PROPIONALDEHYDE	0.93	0.95	1.42	1.11
METHYL ETHYL KETONE	0.12	0.15	0.13	0.12
ETHANOL	0.36	17.11	25.12	34.51
1,3-BUTADIENE	1.16	0.21	0.56	0.74
METHANE	1.64	1.66	1.47	1.01
BENZENE	1.13	0.57	1.01	0.98
TOLUENE	1.09	1.20	1.65	1.60
ETHYLBENZENE	0.43	0.47	0.70	0.57
m- & p-XYLENE	0.89	0.74	1.12	0.73
o-XYLENE	0.42	0.39	0.49	0.34
HEXANE	0.03	0.20	0.27	0.15
STYRENE	0.11	0.11	0.09	0.08

**TABLE 21. PAH-PLUS COMPOUNDS FOR 12.5-L ENGINE,
COMPOSITE RESULTS OVER 8-MODE TEST, ng/hp-hr**

TEST ID	125-4970		125-4932		125-4935		125-4950	
FUEL TYPE	BASELINE FUEL		7.7 % ETHANBOL		10 % ETHANOL		15 % ETHANOL	
COMPOUND/PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE	VAPOR PHASE	PM PHASE
Naphthalene	143664	177	190188	149	154824	98	707495	106
Acenaphthylene	28398	91	22296	64	23297	56	24732	35
Acenaphthene	30382	67	32291	41	31932	25	42270	25
Fluorene	70822	269	56947	184	74026	151	78878	105
Phenanthrene	129464	5001	107998	3246	124868	2566	148862	2054
Anthracene	11327	549	9195	332	10309	275	11839	204
Fluoranthene	2583	1940	3162	1405	3225	1113	4398	1021
Pyrene	4573	4278	7756	4023	8929	3214	11400	2775
Benzo(a)anthracene	18	238	27	368	31	368	66	311
Chrysene	33	601	56	745	76	713	128	668
Benzo(b)fluoranthene	6	71	5	130	8	122	8	142
Benzo(k)fluoranthene	7	73	4	126	5	130	7	115
Benzo(a)pyrene	0	51	0	93	2	118	4	75
Indeno(1,2,3-cd)pyrene	3	13	0	33	3	40	3	35
Dibenzo(a,h)anthracene	0	5	0	6	0	7	0	7
1-Nitropyrene	6	28	1	18	1	18	1	23

Results of the PAH-plus analyses have been presented graphically in Figures 18 through 23. Figure 18 illustrates the total of particulate- and vapor-phase compounds together. Figure 19 shows the compounds separated by phase. In Figure 20, presentation of a subgroup of the lighter molecular weight compounds for the vapor phase only is made. In this view, an increasing trend for pyrene is observed in the vapor phase, and naphthalene, acenaphthene, fluoranthene are higher in the ethanol blends. Acenaphthylene is lower in the ethanol blends. Figure 21 presents the heavier molecular weight compounds for the vapor phase. Benzo(a)anthracene and chrysene show a definite increasing trend with ethanol concentration. Benzo(a)pyrene was higher in the ethanol blends. However, 1-nitropyrene was lower in the ethanol blends. Particulate-phase only compounds are shown in Figures 22 and 23. In Figure 22, where the lighter PAH compounds are shown, decreasing trends for acenaphthylene, fluorene, phenanthrene, anthracene, fluoranthene, and pyrene are seen with increasing ethanol content. The heavier compounds are shown in Figure 23, where all the PAHs are higher for the ethanol blends, but 1-nitropyrene is lower.

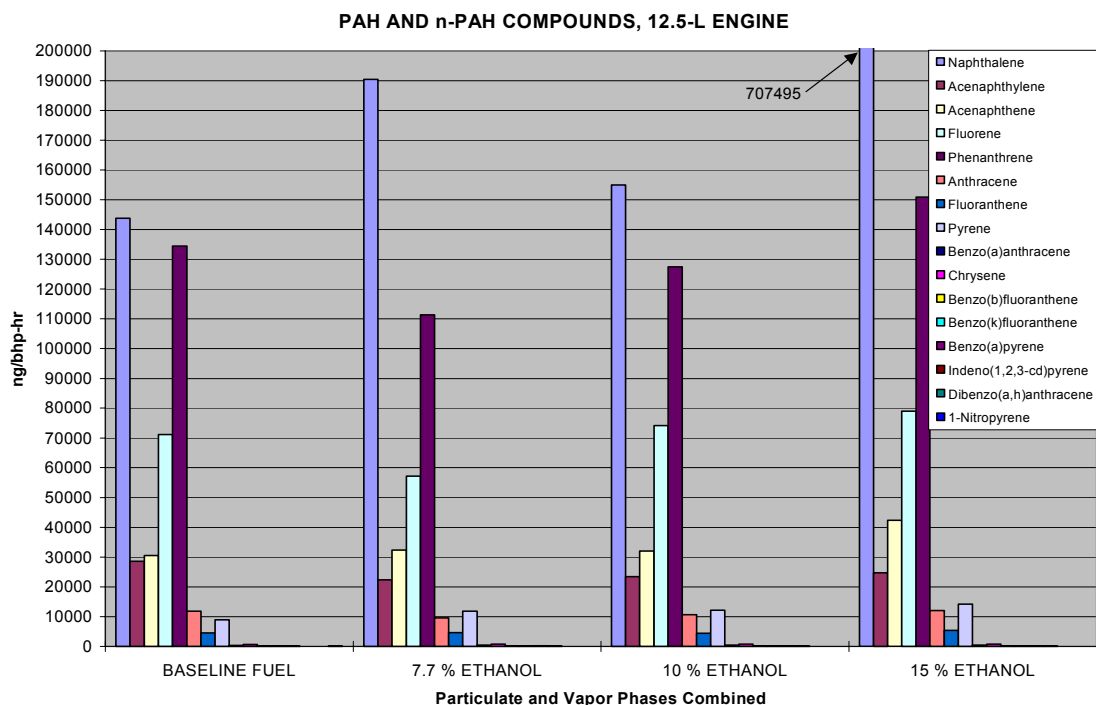


FIGURE 18. PAH-PLUS COMPOUNDS, VAPOR AND PARTICULATE PHASES TOGETHER, 12.5-L ENGINE

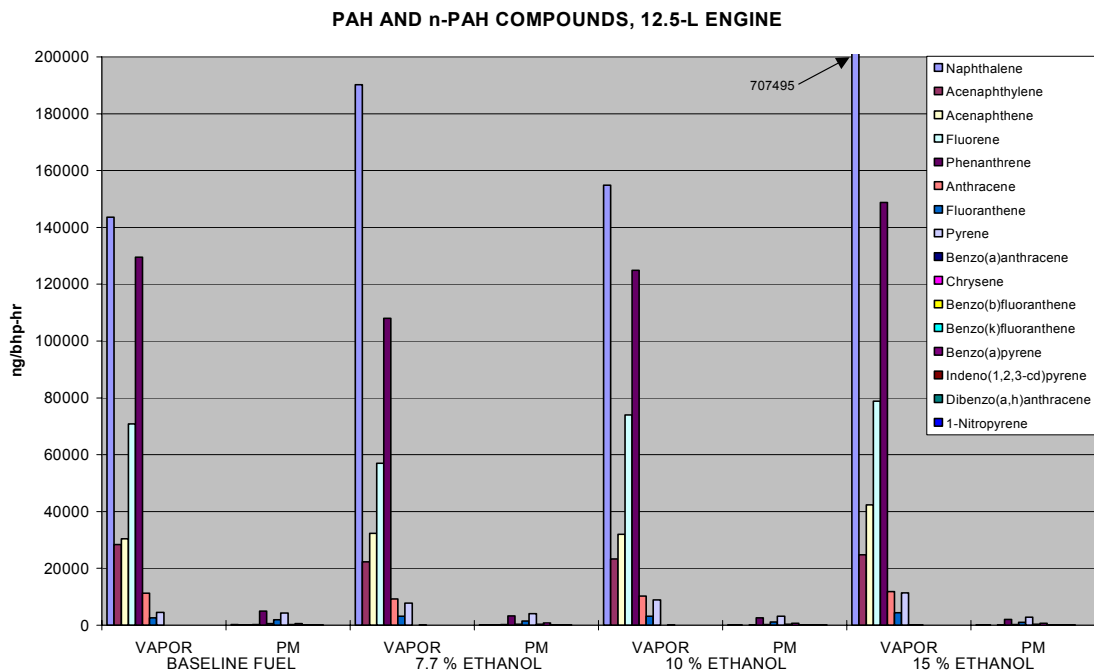


FIGURE 19. PAH-PLUS COMPOUNDS BY PHASE, 12.5-L ENGINE

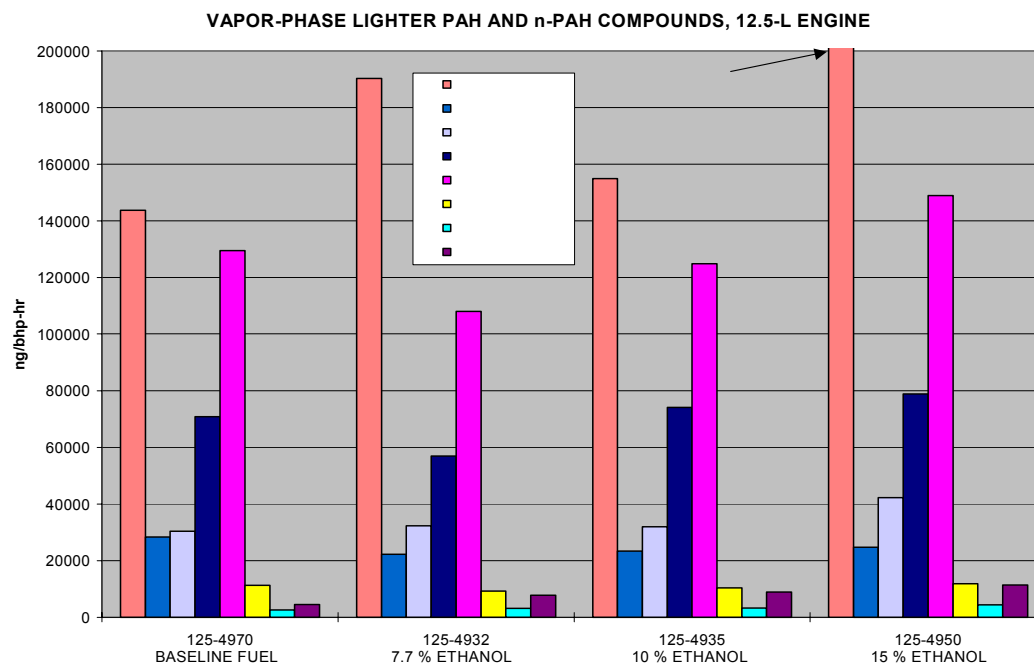


FIGURE 20. HEAVIER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS, VAPOR-PHASE ONLY, 12.5-L ENGINE

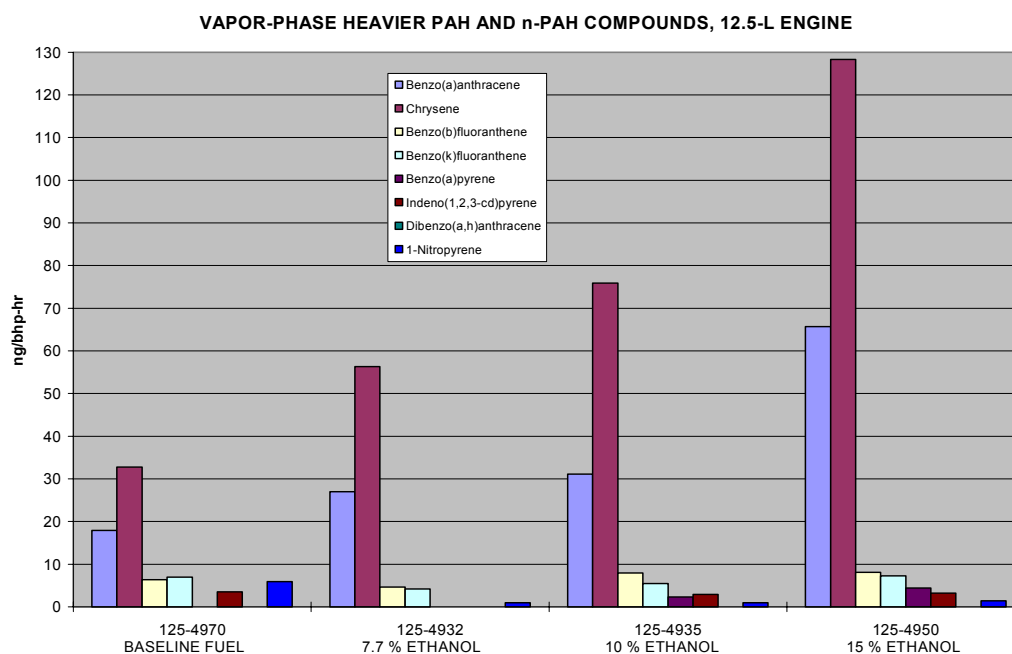


FIGURE 21. HEAVIER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS, VAPOR-PHASE ONLY, 12.5-L ENGINE

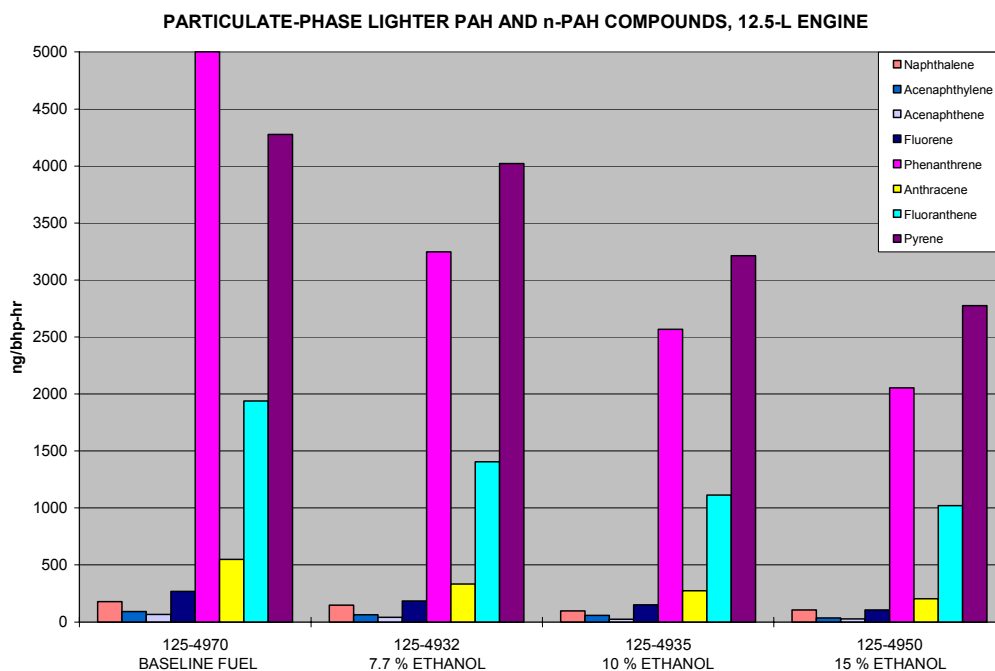


FIGURE 22. LIGHTER MOLECULAR WEIGHT PAH COMPOUNDS, PARTICULATE-PHASE ONLY, 12.5-L ENGINE

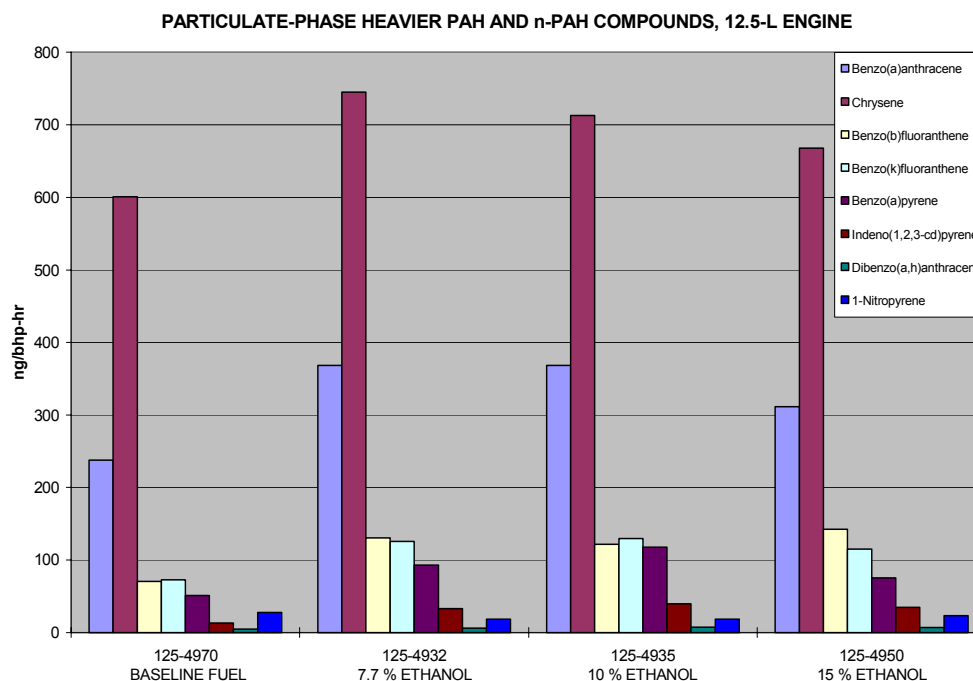


FIGURE 23. HEAVIER MOLECULAR WEIGHT PAH-PLUS COMPOUNDS, PARTICULATE-PHASE ONLY, 12.5-L ENGINE

V. SUMMARY

This project has generated information on the exhaust emissions effects of various blends of ethanol in diesel fuel. Three concentrations of ethanol in diesel were evaluated on three engines of differing technology and displacement. Three suppliers provided additives for improvement of the characteristics and stability of ethanol blended in diesel fuel. Batches of fuel were prepared at each ethanol concentration with all three additives, resulting in a 10-fuel matrix (including reference diesel fuel). The nine alcohol-blended fuels were distributed among the three test engines in a way that each engine experienced operation with each additive and each ethanol concentration.

The engines were operated in duplicate over the 8-mode test procedure described in 40 CFR Part 89, and over the FTP smoke test. Regulated emissions were reported in brake specific output (mass per unit work). Unregulated emissions, including soluble organic fraction of particulate (SOF), individual hydrocarbons, ethanol, and aldehydes, polynuclear aromatic hydrocarbons (PAH) and 1-nitropyrene were reported.

As expected, increasing ethanol concentration led to higher emissions of acetaldehyde (increases ranging from 27 to 139 percent) and ethanol (from trace levels to levels as high as 52 mg/hp-hr). Smoke and particulate matter emissions decreased with increasing ethanol concentration. PM emissions decreased from 13 to 30 percent. Except on the 6.8-L engine, carbon monoxide emissions also decreased, by up to 15 percent, with increasing ethanol concentration. For the 6.8-L engine, CO increased by as much as 22.6 percent. NO_x emissions were reduced with ethanol use on the 6.8-L and 12.5-L engines, with reductions ranging from 5 to 9 percent. Emissions of NO_x increased by as much as 2 percent on the 8.1-L engine.

Toxics such as benzene and 1,3-butadiene were reduced with the use of ethanol. Benzene emissions were reduced by up to 50 percent with the ethanol blended fuels. Emissions of 1,3-butadiene were also substantially decreased, ranging from 24 to 82 percent reduction.

Isolated trends were noted for certain PAH compounds. There was a decrease in 1-nitropyrene with use of ethanol in all cases. Particulate phase 1-nitropyrene was reduced from 18 to 62 percent. There was also a general increase in heavy PAH compounds in the particulate phase with ethanol use, and although less pronounced, a general decrease in light PAH compounds in the particulate phase with ethanol use.

APPENDIX A

BASELINE DIESEL FUEL PROPERTIES



DATE OF SHIPMENT
09-29-03

CUSTOMER PO NO.
4843195S

SALES ORDER NO.
5772454

TRAILER NO. 388

MFG. DATE: 08-2003
SHELF LIFE: UNDETERMINED

CERTIFICATE OF ANALYSIS

DIESEL .05 LS CERT FUEL (# 2)
LOT 3HP05201

<u>TESTS</u>	<u>RESULTS</u>	<u>SPECIFICATIONS</u>	<u>METHOD</u>
Specific Gravity, 60/60	0.8432	0.8398 – 0.8654	ASTM D-4052
API Gravity	36.31	32 – 36	ASTM D-1298
Corrosion, 50°C, 3 hrs	1A	3 Max	ASTM D-130
Sulfur, ppm	394	300 – 500	ASTM D-2622
Flash Point, °F	145.9	130 Min	ASTM D-93
Pour Point, °F	-10	0 Max	ASTM D-97
Cloud Point, °F	+10	10 Max	ASTM D-2500
Viscosity, cs 40°C	2.4	2.2 – 3.2	ASTM D-445
Carbon wt%	86.73	Report	Phillips
Hydrogen wt%	13.23	Report	Phillips
Carbon Density (gm/gal)	2763	2750 – 2806	Calculated
Net Heat of Combustion BTU/LB	18459	Report	ASTM D-3338
Particulate Matter, mg/l	1.4	15 Max	ASTM D-2276
Cetane Index	47.9	Report	ASTM D-976
Cetane Number	47.7	46 – 48	ASTM D-613
			<u>ASTM D-86</u>
<u>DISTILLATION, °F</u>			
IBP	356.2	340 – 400	
5%	387.5		
10%	408.0	400 – 460	
20%	440.8		
30%	463.6		
40%	483.1		
50%	500.2	470 – 540	
60%	517.5		
70%	536.0		
80%	557.4		
90%	586.2	560 – 630	
95%	610.3		
EP	646.0	610 – 690	
Loss	0.6		
Residue	0.6		
			<u>ASTM D-1319</u>
<u>HYDROCARBON TYPE, VOL%</u>			
Aromatics	28.2	28 – 31	
Olefins	2.4	Report	
Saturates	47.4	Report	
SFC Aromatics, wt%	31.2	Report	ASTM D-5186

D.G. Doerr teh

D.G. Doerr
Fuels Unit Team Leader

DGD: teh
09/29/03

October 3, 2003

Test Summary Report for EM-4970-F
PPRD - WO# 24179 (32073)

<u>Method</u>	<u>Property</u>	<u>Results</u>
D1319 (vol%)	FIA - Aromatics	30.8
	- Olefins	0.9
	- Saturates	68.3
<i>Duplicate</i>	<i>aromatics</i>	<i>31.5</i>
	<i>- olefins</i>	<i>0.8</i>
	<i>- saturates</i>	<i>67.7</i>
D2622 (wt%) (ppm)	Sulfur Content	0.0404
		404
D4052	API	36.9
	Specific Gravity	0.8403
D445 (cSt)	Viscosity at 40°C	2.383
D5291 (wt%)	Carbon	85.52
	Hydrogen	12.98
D613	Cetane Number	49.0
D86 (°F)	Distillation - IBP	358
	5 %	387
	10 %	409
	15 %	424
	20 %	438
	30 %	461
	40 %	481
	50 %	498
	60 %	514
	70 %	532
	80 %	554
	90 %	585
	95 %	613
	FBP	636
	Recovered - mLs	98.1
	Residue	1.1
	Loss	0.8
D93 (°F) (°C)	Flash Point	158
		70

APPENDIX B

DETAILED EMISSIONS DATA FOR 8.1-L ENGINE

**APPENDIX B
TABLE OF CONTENTS**

<u>TEST NO.</u>	<u>FUEL TYPE</u>	<u>PAGE</u>
8.1-4970-1	Baseline	B-1 – B-4
8.1-4970-2	Baseline	B-5 – B-8
8.1-4929-1	7.7% Ethanol	B-9 – B-12
8.1-4929-2	7.7% Ethanol	B-13 – B-16
8.1-4936-1	10% Ethanol	B-17 – B-20
8.1-4936-2	10% Ethanol	B-21 – B-24
8.1-4951-1	15% Ethanol	B-25 – B-27
8.1-4951-2	15% Ethanol	B-28 – B-31

UNWEIGHTED 8-MODE TEST RESULTS

8.1-4929-2	7.7% Ethanol	B-32
8.1-4929-1	7.7% Ethanol	B-33
8.1-4936-1	10% Ethanol	B-34
8.1-4936-2	10% Ethanol	B-35
8.1-4951-1	15% Ethanol	B-36
8.1-4951-2	15% Ethanol	B-37
8.1-4970-1	Baseline	B-38
8.1-4970-2	Baseline	B-39

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-1-COR
 Date: 11/04/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	718.0	900	2,200	718.0	103.9	72.0	10.3	29.02	0.993	1.005	0.965	1.004
2	2,200	75.0	538.5	900	2,200	537.0	79.5	72.3	10.4	29.03	0.994	1.004	0.970	1.004
3	2,200	50.0	359.0	900	2,200	359.0	55.8	73.0	10.3	29.03	0.993	1.005	0.973	1.006
4	2,200	10.0	71.8	600	2,201	74.0	19.1	74.1	10.2	29.02	0.990	1.007	0.981	1.009
5	1,400	100.0	1,028.0	600	1,401	1,028.0	88.5	74.0	10.4	29.03	0.994	1.004	0.967	1.009
6	1,400	75.0	771.0	600	1,400	772.0	67.3	74.7	10.3	29.02	0.993	1.005	0.970	1.011
7	1,400	50.0	514.0	600	1,400	515.0	46.0	76.4	10.3	29.02	0.993	1.005	0.973	1.016
8	900	0.0	0.0	900	900	2.0	2.6	77.1	9.6	29.02	0.981	1.015	0.983	1.017

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	300.3	50.13	0.00	50.13	71.7	1,541.5	14.58	149,602
2	224.7	46.12	0.00	46.12	59.5	943.3	16.25	114,480
3	150.0	34.78	0.00	34.78	66.9	549.0	20.54	80,293
4	31.1	43.24	0.00	43.24	167.3	229.0	9.72	27,181
5	273.7	20.73	0.00	20.73	148.7	1,234.2	14.20	127,281
6	205.5	21.94	0.00	21.94	117.6	869.4	12.71	96,875
7	137.2	17.78	0.00	17.78	39.6	569.6	8.70	66,241
8	0.3	14.26	0.00	14.26	31.2	52.9	3.11	3,599

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	45.0	7.52	0.00	7.52	10.75	231.22	2.19	22,440
2	.150	33.7	6.92	0.00	6.92	8.93	141.49	2.44	17,172
3	.150	22.5	5.22	0.00	5.22	10.03	82.35	3.08	12,044
4	.100	3.1	4.32	0.00	4.32	16.73	22.90	0.97	2,718
5	.100	27.4	2.07	0.00	2.07	14.87	123.42	1.42	12,728
6	.100	20.6	2.19	0.00	2.19	11.76	86.94	1.27	9,688
7	.100	13.7	1.78	0.00	1.78	3.96	56.96	0.87	6,624
8	.150	0.0	2.14	0.00	2.14	4.68	7.93	0.47	540
Total		166.0	32.16	0.00	32.16	81.72	753.21	12.70	83,954

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-1-COR
 Date: 11/04/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.06	1.39	0.013	135
2	0.04	0.00	0.04	0.05	0.85	0.015	103
3	0.03	0.00	0.03	0.06	0.50	0.019	73
4	0.03	0.00	0.03	0.10	0.14	0.006	16
5	0.01	0.00	0.01	0.09	0.74	0.009	77
6	0.01	0.00	0.01	0.07	0.52	0.008	58
7	0.01	0.00	0.01	0.02	0.34	0.005	40
8	0.01	0.00	0.01	0.03	0.05	0.003	3

Composite Results

BSHC	=	0.19 g/hp-hr	=	0.26 g/kW-hr
BSCO	=	0.49 g/hp-hr	=	0.66 g/kW-hr
BSNOx	=	4.54 g/hp-hr	=	6.09 g/kW-hr
Particulate	=	0.077 g/hp-hr	=	0.103 g/kW-hr
BSCO2	=	506 g/hp-hr	=	678 g/kW-hr
BSFC	=	0.352 lb/hp-hr	=	0.214 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.19 g/hp-hr	=	0.26 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-1-COR
 Date: 11/04/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.3 (29.02)	98.3 (29.03)	98.3 (29.03)	98.3 (29.02)
Dil. Air: Temp, °C (°F) / AH, g/kg	22.8 (73.0) / 9.0	23.9 (75.0) / 9.2	24.4 (76.0) / 10.3	24.4 (76.0) / 9.6
Engine Air Dew Pt., °C (°F)	14.0 (57.2)	14.1 (57.4)	14.0 (57.2)	13.8 (56.8)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.4 (72.3)	22.8 (73.0)	23.4 (74.1)
Engine Air: RH,% / AH, g/kg	60 / 10.3	59 / 10.4	58 / 10.3	55 / 10.2
NOx Humidity C.F.	.993	.994	.993	.990
Dry-to-Wet C.F.	.965	.970	.973	.981
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	57.93 (2,195.2)	58.21 (2,206.0)	58.53 (2,217.9)	59.08 (2,238.8)
90mm Sample Rate, scmm (scfm)*	0.0335 (1.27)	0.0332 (1.26)	0.0328 (1.24)	0.0342 (1.29)
Total Volume, scm (scf)*	869.5 (32,947)	873.7 (33,108)	878.4 (33,287)	591.2 (22,401)
HC Sample Meter/Range/ppm	0.0/0/26.8	0.0/0/25.9	0.0/0/22.5	0.0/0/26.2
HC Bckgrd Meter/Range/ppm	4.3/100/4.4	5.4/100/5.5	7.1/100/7.2	6.7/100/6.8
CO Sample Meter/Range/ppm (Dry)	18.3/100/17.5	15.0/100/14.3	16.6/100/15.9	39.8/100/38.7
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0
CO2 Sample Meter/Range/% (Wet)	50.2/6/2.2345	85.8/2/1.7130	64.1/2/1.2118	56.9/1/0.4357
CO2 Bckgrd Meter/Range/%	1.5/6/0.0521	3.1/2/0.0510	3.2/2/0.0526	8.0/1/0.0469
NOx Sample Meter/Range/ppm (Dry)	0.0/0/225.7	0.0/0/137.0	0.0/0/79.1	0.0/0/32.6
NOx Bckgrd Meter/Range/ppm	1.8/25/0.5	2.5/25/0.6	1.0/25/0.3	0.8/25/0.2
CH4 Sample Meter/Range/ppm	1.5	1.5	1.7	1.9
CH4 Bckgrd Meter/Range/ppm	2.0	2.0	1.9	2.0
Dilution Factor	6.04	7.88	11.13	30.61
HC Concentration, ppm	23.13	21.09	15.93	19.69
CO Concentration, ppm	16.50	13.63	15.24	37.76
CO2 Concentration, %	2.19	1.67	1.16	0.39
NOx Concentration, ppm	217.49	132.27	76.68	31.76
HC Mass, grams	12.53	11.53	8.70	7.21
CO Mass, grams	17.92	14.88	16.72	27.89
CO2 Mass, grams	37,400.52	28,620.03	20,073.29	4,530.23
NOx Mass, grams	385.36	235.82	137.25	38.16
Part. Mass, grams	3.626	4.044	5.107	1.608
Fuel, kg (lb)	11.782 (25.98)	9.019 (19.89)	6.329 (13.96)	1.446 (3.19)
KW-HR (hp-hr)	55.99 (75.08)	41.89 (56.17)	27.96 (37.50)	3.86 (5.18)
Filter Number	5652	5653	5654	5655
Weight Gain, mg	2.094	2.306	2.860	0.929
Sample Multiplier	1.731	1.754	1.786	1.730
Blower 1, scf	32,928.1	33,089.5	33,268.8	22,388.3
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	37.755	37.650	37.570	25.068
Gas Meter 2, scf	56.784	56.527	56.210	38.013

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L	Test No.: 8.1-4970-1-COR	DIESEL 2D, EM-4970-F
Engine Desc.: 8.1 L (494 CID) IL6	Date: 11/04/2003 Time:	HCR: 1.826 FID Resp: 1.00
Engine Cycle: Diesel	Program SSDIL: 2.32-R	H= 0.133 C= 0.868 O= 0.000 X= 0.000
Engine S/N: 6081H213452	Cell: 16 Bag Cart: 1	

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.3 (29.03)	98.3 (29.02)	98.3 (29.02)	98.3 (29.02)
Dil. Air: Temp, °C (°F) / AH, g/kg	24.4 (76.0) / 9.6	25.6 (78.0) / 10.5	26.1 (79.0) / 11.0	26.1 (79.0) / 10.3
Engine Air Dew Pt., °C (°F)	14.1 (57.4)	14.0 (57.2)	14.0 (57.2)	12.9 (55.3)
Engine Air Temp, °C (°F)	23.3 (74.0)	23.7 (74.7)	24.7 (76.4)	25.1 (77.1)
Engine Air: RH,% / AH, g/kg	56 / 10.4	54 / 10.3	51 / 10.3	47 / 9.6
NOx Humidity C.F.	.994	.993	.993	.981
Dry-to-Wet C.F.	.967	.970	.973	.983
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	57.92 (2,195.0)	58.13 (2,202.7)	58.82 (2,228.8)	58.91 (2,232.5)
90mm Sample Rate, scmm (scfm)*	0.0336 (1.27)	0.0336 (1.27)	0.0339 (1.28)	0.0343 (1.30)
Total Volume, scm (scf)*	579.6 (21,962)	581.6 (22,040)	588.5 (22,301)	884.2 (33,506)
HC Sample Meter/Range/ppm	0.0/0/15.6	0.0/0/16.1	0.0/0/15.0	0.0/0/13.2
HC Bckgrd Meter/Range/ppm	7.2/100/7.3	6.9/100/7.0	7.4/100/7.5	6.7/100/6.8
CO Sample Meter/Range/ppm (Dry)	37.2/100/36.1	29.2/100/28.2	9.8/100/9.3	7.6/100/7.2
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0
CO2 Sample Meter/Range/% (Wet)	93.6/2/1.9053	74.9/2/1.4550	54.2/2/0.9997	16.0/1/0.0972
CO2 Bckgrd Meter/Range/%	2.9/2/0.0477	2.8/2/0.0460	2.9/2/0.0477	7.8/1/0.0457
NOx Sample Meter/Range/ppm (Dry)	0.0/0/180.1	0.0/0/126.2	0.0/0/81.5	0.0/0/7.6
NOx Bckgrd Meter/Range/ppm	1.2/25/0.3	0.8/25/0.2	0.9/25/0.2	0.3/25/0.1
CH4 Sample Meter/Range/ppm	1.6	1.6	1.7	2.0
CH4 Bckgrd Meter/Range/ppm	2.2	2.2	1.9	2.0
Dilution Factor	7.08	9.27	13.51	136.39
HC Concentration, ppm	9.38	9.85	8.11	6.49
CO Concentration, ppm	34.24	26.98	8.97	7.07
CO2 Concentration, %	1.86	1.41	0.96	0.05
NOx Concentration, ppm	173.93	122.25	79.16	7.43
HC Mass, grams	3.45	3.66	2.96	3.56
CO Mass, grams	24.79	19.61	6.60	7.81
CO2 Mass, grams	21,213.58	16,145.90	11,040.19	899.84
NOx Mass, grams	205.70	144.90	94.93	13.22
Part. Mass, grams	2.357	2.108	1.442	0.767
Fuel, kg (lb)	6.686 (14.74)	5.091 (11.22)	3.478 (7.67)	0.290 (0.64)
KW-HR (hp-hr)	34.01 (45.61)	25.54 (34.25)	17.05 (22.86)	0.05 (0.07)
Filter Number	5656	5657	5658	5659
Weight Gain, mg	1.366	1.218	0.830	0.446
Sample Multiplier	1.725	1.731	1.737	1.720
Blower 1, scf	21,949.5	22,027.3	22,287.8	33,487.0
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.082	25.054	25.006	37.476
Gas Meter 2, scf	37.811	37.789	37.842	56.952

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-2-COR
 Date: 11/05/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	717.0	900	2,199	717.0	101.4	72.0	10.4	29.09	0.994	1.005	0.963	1.002
2	2,200	75.0	537.8	900	2,200	536.0	80.2	72.7	10.5	29.09	0.997	1.002	0.968	1.004
3	2,200	50.0	358.5	900	2,200	358.0	54.3	73.0	10.5	29.10	0.997	1.003	0.973	1.005
4	2,200	10.0	71.7	600	2,201	74.0	18.8	74.0	10.1	29.11	0.989	1.008	0.979	1.007
5	1,400	100.0	1,029.0	600	1,401	1,029.0	88.3	74.0	10.4	29.12	0.994	1.005	0.967	1.007
6	1,400	75.0	771.8	600	1,400	774.0	66.4	75.1	10.3	29.11	0.992	1.006	0.970	1.010
7	1,400	50.0	514.5	600	1,402	516.0	45.3	76.2	10.3	29.11	0.992	1.006	0.973	1.013
8	900	0.0	0.0	900	901	2.0	2.6	77.8	9.6	29.11	0.980	1.015	0.982	1.017

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	300.0	48.68	0.00	48.68	69.2	1,538.9	13.89	145,937
2	224.1	44.50	0.00	44.50	57.3	923.2	15.61	115,467
3	149.9	35.85	0.00	35.85	66.8	543.8	19.73	78,163
4	30.8	46.32	6.10	40.22	168.3	224.8	9.30	26,698
5	273.9	22.62	0.26	22.36	143.8	1,221.7	14.04	127,060
6	205.9	24.02	0.00	24.02	119.0	861.4	12.59	95,486
7	137.6	22.34	0.00	22.34	41.3	564.3	8.58	65,211
8	0.4	18.16	0.38	17.78	30.4	53.6	3.18	3,600

Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	45.0	7.30	0.00	7.30	10.38	230.84	2.08	21,891
2	.150	33.6	6.67	0.00	6.67	8.59	138.48	2.34	17,320
3	.150	22.5	5.38	0.00	5.38	10.02	81.57	2.96	11,724
4	.100	3.1	4.63	0.61	4.02	16.83	22.48	0.93	2,670
5	.100	27.4	2.26	0.03	2.24	14.38	122.17	1.40	12,706
6	.100	20.6	2.40	0.00	2.40	11.90	86.14	1.26	9,549
7	.100	13.8	2.23	0.00	2.23	4.13	56.43	0.86	6,521
8	.150	0.1	2.72	0.06	2.67	4.57	8.03	0.48	540
Total		165.9	33.61	0.69	32.91	80.81	746.15	12.31	82,921

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-2-COR
 Date: 11/05/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.04	0.00	0.04	0.06	1.39	0.013	132
2	0.04	0.00	0.04	0.05	0.83	0.014	104
3	0.03	0.00	0.03	0.06	0.49	0.018	71
4	0.03	0.00	0.02	0.10	0.14	0.006	16
5	0.01	0.00	0.01	0.09	0.74	0.008	77
6	0.01	0.00	0.01	0.07	0.52	0.008	58
7	0.01	0.00	0.01	0.02	0.34	0.005	39
8	0.02	0.00	0.02	0.03	0.05	0.003	3

Composite Results

BSHC	=	0.20 g/hp-hr	=	0.27 g/kW-hr
BSCO	=	0.49 g/hp-hr	=	0.65 g/kW-hr
BSNOx	=	4.50 g/hp-hr	=	6.03 g/kW-hr
Particulate	=	0.074 g/hp-hr	=	0.100 g/kW-hr
BSCO2	=	500 g/hp-hr	=	670 g/kW-hr
BSFC	=	0.347 lb/hp-hr	=	0.211 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.01 g/kW-hr
NMHC	=	0.20 g/hp-hr	=	0.27 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L	Test No.: 8.1-4970-2-COR	DIESEL 2D, EM-4970-F
Engine Desc.: 8.1 L (494 CID) IL6	Date: 11/05/2003 Time:	HCR: 1.826 FID Resp: 1.00
Engine Cycle: Diesel	Program SSDIL: 2.32-R	H= 0.133 C= 0.868 O= 0.000 X= 0.000
Engine S/N: 6081H213452	Cell: 16 Bag Cart: 1	

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.5 (29.09)	98.5 (29.09)	98.5 (29.10)	98.6 (29.11)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 10.7	26.1 (79.0) / 10.3	26.7 (80.0) / 10.0	26.7 (80.0) / 10.7
Engine Air Dew Pt., °C (°F)	14.1 (57.4)	14.3 (57.8)	14.3 (57.8)	13.7 (56.7)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.6 (72.7)	22.8 (73.0)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	60 / 10.4	60 / 10.5	59 / 10.5	55 / 10.1
NOx Humidity C.F.	.994	.997	.997	.989
Dry-to-Wet C.F.	.963	.968	.973	.979
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	57.85 (2,192.1)	58.32 (2,210.1)	58.89 (2,231.6)	59.25 (2,245.4)
90mm Sample Rate, scmm (scfm)*	0.0335 (1.27)	0.0332 (1.26)	0.0330 (1.25)	0.0345 (1.31)
Total Volume, scm (scf)*	868.2 (32,900)	875.4 (33,171)	883.9 (33,493)	592.9 (22,467)
HC Sample Meter/Range/ppm	0.0/0/28.0	0.0/0/26.9	0.0/0/22.1	0.0/0/26.1
HC Bckgrd Meter/Range/ppm	6.4/100/6.5	7.3/100/7.4	6.3/100/6.4	5.5/100/5.6
CO Sample Meter/Range/ppm (Dry)	17.7/100/17.0	14.5/100/13.8	16.5/100/15.8	39.9/100/38.8
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.1/100/0.1	0.1/100/0.1	0.0/100/0.0
CO2 Sample Meter/Range/% (Wet)	49.2/6/2.1782	40.7/6/1.7221	62.1/2/1.1681	55.8/1/0.4242
CO2 Bckgrd Meter/Range/%	1.3/6/0.0451	1.4/6/0.0486	2.8/2/0.0460	7.4/1/0.0433
NOx Sample Meter/Range/ppm (Dry)	0.0/0/225.8	0.0/0/133.4	0.0/0/77.4	0.0/0/31.9
NOx Bckgrd Meter/Range/ppm	0.9/25/0.2	0.8/25/0.2	0.4/25/0.1	0.3/25/0.1
CH4 Sample Meter/Range/ppm	1.6	1.5	1.7	4.4
CH4 Bckgrd Meter/Range/ppm	2.1	1.9	2.1	2.1
Dilution Factor	6.20	7.84	11.55	31.43
HC Concentration, ppm	22.60	20.41	16.26	20.70
CO Concentration, ppm	15.96	13.10	15.12	37.88
CO2 Concentration, %	2.14	1.68	1.13	0.38
NOx Concentration, ppm	217.24	128.90	75.20	31.13
HC Mass, grams	12.17	11.12	8.96	7.72
CO Mass, grams	17.31	14.32	16.70	28.06
CO2 Mass, grams	36,484.20	28,866.86	19,540.74	4,449.71
NOx Mass, grams	384.73	230.80	135.95	37.46
Part. Mass, grams	3.457	3.893	4.920	1.538
Fuel, kg (lb)	11.493 (25.34)	9.096 (20.06)	6.162 (13.59)	1.421 (3.13)
KW-HR (hp-hr)	55.93 (75.00)	41.78 (56.03)	27.95 (37.48)	3.83 (5.14)
Filter Number	5661.0-89	5662.0-90	5696.0-91	5697.0-92
Weight Gain, mg	2.002	2.218	2.755	0.894
Sample Multiplier	1.727	1.755	1.786	1.720
Blower 1, scf	32,881.4	33,151.8	33,474.5	22,453.6
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	37.587	37.495	37.572	25.068
Gas Meter 2, scf	56.643	56.392	56.326	38.129

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-2-COR
 Date: 11/05/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.6 (29.12)	98.6 (29.11)	98.6 (29.11)	98.6 (29.11)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.7 (80.0) / 10.0	27.2 (81.0) / 10.5	26.7 (80.0) / 11.5	26.1 (79.0) / 11.0
Engine Air Dew Pt., °C (°F)	14.1 (57.4)	14.0 (57.2)	14.0 (57.2)	12.9 (55.3)
Engine Air Temp, °C (°F)	23.3 (74.0)	23.9 (75.1)	24.6 (76.2)	25.4 (77.8)
Engine Air: RH,% / AH, g/kg	56 / 10.4	54 / 10.3	52 / 10.3	46 / 9.6
NOx Humidity C.F.	.994	.992	.992	.980
Dry-to-Wet C.F.	.967	.970	.973	.982
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	58.29 (2,209.0)	58.48 (2,215.9)	59.03 (2,236.8)	59.05 (2,237.8)
90mm Sample Rate, scmm (scfm)*	0.0336 (1.27)	0.0337 (1.28)	0.0341 (1.29)	0.0344 (1.30)
Total Volume, scm (scf)*	583.3 (22,102)	585.1 (22,172)	590.6 (22,381)	886.3 (33,586)
HC Sample Meter/Range/ppm	0.0/0/15.4	0.0/0/15.7	0.0/0/15.3	0.0/0/14.8
HC Bckgrd Meter/Range/ppm	5.7/100/5.8	5.2/100/5.3	5.7/100/5.8	6.5/100/6.6
CO Sample Meter/Range/ppm (Dry)	35.7/100/34.6	29.3/100/28.3	10.2/100/9.7	7.4/100/7.0
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0
CO2 Sample Meter/Range/% (Wet)	93.0/2/1.8903	73.6/2/1.4251	53.4/2/0.9830	15.8/1/0.0959
CO2 Bckgrd Meter/Range/%	2.9/2/0.0477	2.7/2/0.0444	3.0/2/0.0493	7.6/1/0.0445
NOx Sample Meter/Range/ppm (Dry)	0.0/0/177.2	0.0/0/124.3	0.0/0/80.5	0.0/0/7.8
NOx Bckgrd Meter/Range/ppm	0.6/25/0.2	0.4/25/0.1	0.5/25/0.1	0.4/25/0.1
CH4 Sample Meter/Range/ppm	1.8	1.8	1.7	2.1
CH4 Bckgrd Meter/Range/ppm	2.0	2.0	2.1	2.0
Dilution Factor	7.14	9.47	13.73	138.00
HC Concentration, ppm	10.45	11.04	9.96	8.27
CO Concentration, ppm	32.88	27.14	9.34	6.87
CO2 Concentration, %	1.85	1.39	0.94	0.05
NOx Concentration, ppm	171.18	120.48	78.19	7.51
HC Mass, grams	3.77	4.00	3.72	4.54
CO Mass, grams	23.96	19.84	6.89	7.61
CO2 Mass, grams	21,176.64	15,914.34	10,868.44	900.03
NOx Mass, grams	203.62	143.57	94.06	13.39
Part. Mass, grams	2.330	2.087	1.423	0.783
Fuel, kg (lb)	6.675 (14.72)	5.018 (11.07)	3.425 (7.55)	0.291 (0.64)
KW-HR (hp-hr)	34.04 (45.65)	25.58 (34.31)	17.10 (22.93)	0.07 (0.09)
Filter Number	5698.0-93	5699.0-94	5700.0-95	5701.0-96
Weight Gain, mg	1.342	1.202	0.822	0.455
Sample Multiplier	1.736	1.736	1.731	1.720
Blower 1, scf	22,089.7	22,159.1	22,368.1	33,566.9
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.151	25.137	25.147	37.647
Gas Meter 2, scf	37.882	37.910	38.078	57.172

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-1-COR
 Date: 11/06/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4929-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	688.0	900	2,201	688.0	99.4	72.0	9.7	29.25	0.982	1.013	0.963	0.997
2	2,200	75.0	516.0	900	2,201	516.0	77.8	72.5	9.7	29.26	0.982	1.013	0.970	0.999
3	2,200	50.0	344.0	900	2,200	345.0	55.3	72.4	9.7	29.27	0.982	1.013	0.975	0.998
4	2,200	10.0	68.8	600	2,200	71.0	18.8	74.0	9.5	29.28	0.979	1.016	0.980	1.002
5	1,400	100.0	965.0	600	1,399	965.0	83.7	73.3	9.6	29.28	0.980	1.015	0.969	1.000
6	1,400	75.0	723.8	600	1,400	735.0	63.7	74.3	9.7	29.28	0.982	1.013	0.973	1.003
7	1,400	50.0	482.5	600	1,400	489.0	43.5	74.9	9.6	29.18	0.980	1.015	0.975	1.007
8	900	0.0	0.0	900	901	0.0	2.5	75.8	9.5	29.28	0.978	1.017	0.984	1.007

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	288.2	48.27	0.00	48.27	56.3	1,501.2	11.68	139,051
2	215.9	44.66	0.00	44.66	53.2	927.5	10.36	108,742
3	144.5	37.65	0.00	37.65	63.6	530.0	16.07	77,255
4	29.6	51.86	0.46	51.41	163.7	213.1	9.32	25,963
5	256.6	23.77	0.00	23.77	118.0	1,139.6	10.87	116,920
6	195.7	31.20	0.00	31.20	85.9	811.8	9.16	88,988
7	130.2	20.98	0.00	20.98	35.0	527.7	7.02	60,853
8	0.0	24.70	0.14	24.56	32.9	46.3	3.22	3,376

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	43.2	7.24	0.00	7.24	8.44	225.18	1.75	20,858
2	.150	32.4	6.70	0.00	6.70	7.98	139.12	1.55	16,311
3	.150	21.7	5.65	0.00	5.65	9.54	79.50	2.41	11,588
4	.100	3.0	5.19	0.05	5.14	16.37	21.31	0.93	2,596
5	.100	25.7	2.38	0.00	2.38	11.80	113.96	1.09	11,692
6	.100	19.6	3.12	0.00	3.12	8.59	81.18	0.92	8,899
7	.100	13.0	2.10	0.00	2.10	3.50	52.77	0.70	6,085
8	.150	0.0	3.70	0.02	3.68	4.93	6.94	0.48	506
Total		158.5	36.07	0.07	36.01	71.17	719.96	9.84	78,536

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-1-COR
 Date: 11/06/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4929-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.05	1.42	0.011	132
2	0.04	0.00	0.04	0.05	0.88	0.010	103
3	0.04	0.00	0.04	0.06	0.50	0.015	73
4	0.03	0.00	0.03	0.10	0.13	0.006	16
5	0.01	0.00	0.01	0.07	0.72	0.007	74
6	0.02	0.00	0.02	0.05	0.51	0.006	56
7	0.01	0.00	0.01	0.02	0.33	0.004	38
8	0.02	0.00	0.02	0.03	0.04	0.003	3

Composite Results

BSHC	=	0.23 g/hp-hr	=	0.31 g/kW-hr
BSCO	=	0.45 g/hp-hr	=	0.60 g/kW-hr
BSNOx	=	4.54 g/hp-hr	=	6.09 g/kW-hr
Particulate	=	0.062 g/hp-hr	=	0.083 g/kW-hr
BSCO2	=	496 g/hp-hr	=	664 g/kW-hr
BSFC	=	0.355 lb/hp-hr	=	0.216 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.23 g/hp-hr	=	0.30 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-1-COR
 Date: 11/06/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4929-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.0 (29.25)	99.1 (29.26)	99.1 (29.27)	99.1 (29.28)
Dil. Air: Temp, °C (°F) / AH, g/kg	23.3 (74.0) / 11.4	24.4 (76.0) / 9.5	25.0 (77.0) / 9.3	25.0 (77.0) / 9.9
Engine Air Dew Pt., °C (°F)	13.2 (55.8)	13.2 (55.8)	13.2 (55.8)	12.9 (55.3)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.5 (72.5)	22.4 (72.4)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	57 / 9.7	56 / 9.7	56 / 9.7	52 / 9.5
NOx Humidity C.F.	.982	.982	.982	.979
Dry-to-Wet C.F.	.963	.970	.975	.980
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	58.88 (2,231.1)	59.17 (2,242.1)	59.54 (2,256.1)	59.62 (2,259.2)
90mm Sample Rate, scmm (scfm)*	0.0338 (1.28)	0.0339 (1.29)	0.0338 (1.28)	0.0343 (1.30)
Total Volume, scm (scf)*	883.7 (33,486)	888.0 (33,651)	893.6 (33,861)	596.5 (22,605)
HC Sample Meter/Range/ppm	0.0/0/28.6	0.0/0/26.9	0.0/0/24.9	0.0/0/29.4
HC Bckgrd Meter/Range/ppm	7.8/100/7.9	7.4/100/7.5	8.7/100/8.8	6.1/100/6.2
CO Sample Meter/Range/ppm (Dry)	14.2/100/13.6	13.2/100/12.6	16.3/100/15.6	38.7/100/37.6
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.0/100/0.0	0.9/100/0.8	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	46.9/6/2.0509	38.4/6/1.6052	28.8/6/1.1454	55.2/1/0.4179
CO2 Bckgrd Meter/Range/%	1.6/6/0.0556	1.5/6/0.0521	1.4/6/0.0486	8.5/1/0.0500
NOx Sample Meter/Range/ppm (Dry)	0.0/0/219.2	0.0/0/133.9	0.0/0/75.7	0.0/0/30.4
NOx Bckgrd Meter/Range/ppm	1.8/25/0.5	1.7/25/0.4	1.0/25/0.3	0.7/25/0.2
CH4 Sample Meter/Range/ppm	1.8	1.9	2.0	2.4
CH4 Bckgrd Meter/Range/ppm	2.3	2.2	2.4	2.3
Dilution Factor	6.59	8.42	11.78	31.91
HC Concentration, ppm	21.96	20.27	16.90	23.38
CO Concentration, ppm	12.74	11.99	14.25	36.62
CO2 Concentration, %	2.00	1.56	1.10	0.37
NOx Concentration, ppm	210.64	129.51	73.56	29.63
HC Mass, grams	12.07	11.16	9.41	8.64
CO Mass, grams	14.07	13.31	15.91	27.29
CO2 Mass, grams	34,762.80	27,185.46	19,313.66	4,327.09
NOx Mass, grams	375.30	231.87	132.50	35.52
Part. Mass, grams	2.882	2.555	3.964	1.528
Fuel, kg (lb)	11.275 (24.86)	8.820 (19.45)	6.271 (13.83)	1.424 (3.14)
KW-HR (hp-hr)	53.73 (72.05)	40.25 (53.98)	26.93 (36.12)	3.68 (4.93)
Filter Number	5720	5726	5727	5728
Weight Gain, mg	1.652	1.464	2.250	0.880
Sample Multiplier	1.745	1.745	1.762	1.737
Blower 1, scf	33,466.6	33,631.6	33,841.3	22,592.1
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	38.085	37.865	37.937	25.278
Gas Meter 2, scf	57.277	57.148	57.155	38.294

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-1-COR
 Date: 11/06/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4929-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.1 (29.28)	99.1 (29.28)	98.8 (29.18)	99.1 (29.28)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.6 (78.0) / 9.7	25.6 (78.0) / 9.0	25.6 (78.0) / 10.5	25.6 (78.0) / 9.7
Engine Air Dew Pt., °C (°F)	13.0 (55.4)	13.2 (55.8)	13.0 (55.4)	12.8 (55.1)
Engine Air Temp, °C (°F)	22.9 (73.3)	23.5 (74.3)	23.8 (74.9)	24.3 (75.8)
Engine Air: RH,% / AH, g/kg	53 / 9.6	52 / 9.7	51 / 9.6	49 / 9.5
NOx Humidity C.F.	.980	.982	.980	.978
Dry-to-Wet C.F.	.969	.973	.975	.984
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	59.18 (2,242.5)	59.41 (2,251.1)	59.31 (2,247.6)	59.62 (2,259.2)
90mm Sample Rate, scmm (scfm)*	0.0342 (1.30)	0.0343 (1.30)	0.0342 (1.30)	0.0345 (1.31)
Total Volume, scm (scf)*	592.1 (22,438)	594.4 (22,524)	593.5 (22,489)	894.8 (33,908)
HC Sample Meter/Range/ppm	0.0/0/15.3	0.0/0/20.3	0.0/0/15.1	0.0/0/16.6
HC Bckgrd Meter/Range/ppm	5.1/100/5.2	6.8/100/6.9	6.0/100/6.1	5.4/100/5.5
CO Sample Meter/Range/ppm (Dry)	28.9/100/27.9	20.9/100/20.1	8.6/100/8.2	7.9/100/7.5
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0	0.0/100/0.0
CO2 Sample Meter/Range/% (Wet)	86.0/2/1.7179	68.9/2/1.3184	92.4/1/0.9165	15.6/1/0.0946
CO2 Bckgrd Meter/Range/%	2.9/2/0.0477	3.2/2/0.0526	8.4/1/0.0494	8.0/1/0.0469
NOx Sample Meter/Range/ppm (Dry)	0.0/0/164.9	0.0/0/116.2	0.0/0/75.7	0.0/0/6.7
NOx Bckgrd Meter/Range/ppm	0.9/25/0.2	0.8/25/0.2	0.6/25/0.2	0.4/25/0.1
CH4 Sample Meter/Range/ppm	2.0	2.0	2.0	2.2
CH4 Bckgrd Meter/Range/ppm	2.3	2.2	2.3	2.1
Dilution Factor	7.87	10.24	14.74	139.65
HC Concentration, ppm	10.78	14.07	9.44	11.14
CO Concentration, ppm	26.58	19.28	7.88	7.35
CO2 Concentration, %	1.68	1.27	0.87	0.05
NOx Concentration, ppm	159.53	112.92	73.66	6.44
HC Mass, grams	3.96	5.20	3.50	6.17
CO Mass, grams	19.66	14.32	5.84	8.22
CO2 Mass, grams	19,486.60	14,831.34	10,142.23	843.89
NOx Mass, grams	189.94	135.29	87.95	11.57
Part. Mass, grams	1.785	1.506	1.152	0.792
Fuel, kg (lb)	6.323 (13.94)	4.815 (10.62)	3.290 (7.26)	0.284 (0.63)
KW-HR (hp-hr)	31.89 (42.77)	24.32 (32.61)	16.18 (21.70)	0.01 (0.01)
Filter Number	5729	5730	5731	5732
Weight Gain, mg	1.032	0.868	0.664	0.458
Sample Multiplier	1.730	1.735	1.736	1.728
Blower 1, scf	22,424.8	22,510.9	22,476.3	33,888.7
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.222	25.291	25.192	37.852
Gas Meter 2, scf	38.195	38.271	38.149	57.470

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
Engine Desc.: 8.1 L (494 CID) IL6
Engine Cycle: Diesel
Engine S/N: 6081H213452

Test No.: 8.1-4929-2-COR
Date: 11/07/2003 Time:
Program SSDIL: 2.32-R
Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4829-F
HCR: 1.852 FID Resp: 1.00
H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	661.0	900	2,200	661.0	96.3	72.0	9.2	29.31	0.974	1.020	0.968	0.995
2	2,200	75.0	495.8	900	2,200	495.0	73.3	72.4	9.1	29.32	0.972	1.021	0.972	0.996
3	2,200	50.0	330.5	900	2,199	331.0	52.8	73.2	9.2	29.32	0.974	1.020	0.976	0.999
4	2,200	10.0	66.1	600	2,200	69.0	19.1	72.0	9.0	29.33	0.969	1.024	0.982	0.995
5	1,400	100.0	947.0	600	1,400	947.0	83.4	73.0	9.1	29.34	0.972	1.022	0.970	0.997
6	1,400	75.0	710.3	600	1,400	718.0	63.5	73.3	9.5	29.33	0.978	1.017	0.974	0.999
7	1,400	50.0	473.5	600	1,400	478.0	43.6	73.0	9.5	29.34	0.979	1.016	0.978	0.998
8	900	0.0	0.0	900	901	-1.0	2.5	74.0	9.4	29.34	0.978	1.017	0.986	1.001

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	276.7	47.69	0.00	47.69	54.3	1,416.4	11.88	134,642
2	207.1	44.96	0.00	44.96	53.7	871.5	13.12	102,396
3	138.6	37.63	0.00	37.63	66.9	509.1	15.47	73,746
4	28.8	55.11	0.30	54.80	174.5	207.6	9.47	26,285
5	251.8	28.70	0.00	28.70	110.8	1,112.2	10.52	116,593
6	191.0	29.73	0.03	29.70	78.0	790.2	8.88	88,734
7	127.2	22.50	0.00	22.50	35.9	529.2	6.76	60,875
8	0.0	23.16	0.02	23.15	36.0	42.2	3.32	3,417

Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
5	.100	25.2	2.87	0.00	2.87	11.08	111.22	1.05	11,659
6	.100	19.1	2.97	0.00	2.97	7.80	79.02	0.89	8,873
7	.100	12.7	2.25	0.00	2.25	3.59	52.92	0.68	6,088
8	.150	0.0	3.47	0.00	3.47	5.40	6.33	0.50	513
1	.150	41.5	7.15	0.00	7.15	8.15	212.45	1.78	20,196
2	.150	31.1	6.74	0.00	6.74	8.06	130.73	1.97	15,359
3	.150	20.8	5.64	0.00	5.64	10.04	76.36	2.32	11,062
4	.100	2.9	5.51	0.03	5.48	17.45	20.76	0.95	2,628
Total		153.2	36.62	0.04	36.58	71.56	689.81	10.13	76,379

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-2-COR
 Date: 11/07/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4829-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.05	1.39	0.012	132
2	0.04	0.00	0.04	0.05	0.85	0.013	100
3	0.04	0.00	0.04	0.07	0.50	0.015	72
4	0.04	0.00	0.04	0.11	0.14	0.006	17
5	0.02	0.00	0.02	0.07	0.73	0.007	76
6	0.02	0.00	0.02	0.05	0.52	0.006	58
7	0.01	0.00	0.01	0.02	0.35	0.004	40
8	0.02	0.00	0.02	0.04	0.04	0.003	3

Composite Results

BSHC	=	0.24 g/hp-hr	=	0.32 g/kW-hr
BSCO	=	0.47 g/hp-hr	=	0.63 g/kW-hr
BSNOx	=	4.50 g/hp-hr	=	6.04 g/kW-hr
Particulate	=	0.066 g/hp-hr	=	0.089 g/kW-hr
BSCO2	=	498 g/hp-hr	=	668 g/kW-hr
BSFC	=	0.357 lb/hp-hr	=	0.217 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.24 g/hp-hr	=	0.32 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-2-COR
 Date: 11/07/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4829-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.2 (29.31)	99.3 (29.32)	99.3 (29.32)	99.3 (29.33)
Dil. Air: Temp, °C (°F) / AH, g/kg	22.8 (73.0) / 8.9	23.9 (75.0) / 9.0	25.0 (77.0) / 8.6	25.6 (78.0) / 9.0
Engine Air Dew Pt., °C (°F)	12.5 (54.5)	12.3 (54.2)	12.5 (54.5)	12.1 (53.7)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.4 (72.4)	22.9 (73.2)	22.2 (72.0)
Engine Air: RH,% / AH, g/kg	54 / 9.2	53 / 9.1	52 / 9.2	53 / 9.0
NOx Humidity C.F.	.974	.972	.974	.969
Dry-to-Wet C.F.	.968	.972	.976	.982
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	59.94 (2,271.5)	60.54 (2,294.0)	61.04 (2,313.0)	60.94 (2,309.4)
90mm Sample Rate, scmm (scfm)*	0.0338 (1.28)	0.0341 (1.29)	0.0340 (1.29)	0.0347 (1.32)
Total Volume, scm (scf)*	899.7 (34,091)	908.6 (34,430)	916.1 (34,714)	609.8 (23,107)
HC Sample Meter/Range/ppm	0.0/0/27.5	0.0/0/26.6	0.0/0/24.2	0.0/0/31.4
HC Bckgrd Meter/Range/ppm	7.3/100/7.4	7.5/100/7.6	8.3/100/8.4	7.2/100/7.3
CO Sample Meter/Range/ppm (Dry)	13.4/100/12.8	13.0/100/12.4	16.2/100/15.5	40.6/100/39.5
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.0/100/0.0	0.4/100/0.4	0.5/100/0.5
CO2 Sample Meter/Range/% (Wet)	45.1/6/1.9533	76.0/2/1.4805	57.7/2/1.0735	54.8/1/0.4138
CO2 Bckgrd Meter/Range/%	1.6/6/0.0556	3.1/2/0.0510	3.2/2/0.0526	8.4/1/0.0494
NOx Sample Meter/Range/ppm (Dry)	0.0/0/203.6	0.0/0/123.8	0.0/0/71.4	0.0/0/29.2
NOx Bckgrd Meter/Range/ppm	0.9/25/0.2	0.8/25/0.2	0.9/25/0.2	0.7/25/0.2
CH4 Sample Meter/Range/ppm	1.6	1.8	1.9	2.4
CH4 Bckgrd Meter/Range/ppm	2.2	2.2	2.2	2.4
Dilution Factor	6.92	9.13	12.57	32.19
HC Concentration, ppm	21.20	19.81	16.51	24.32
CO Concentration, ppm	12.08	11.84	14.62	38.17
CO2 Concentration, %	1.91	1.44	1.03	0.37
NOx Concentration, ppm	196.87	120.17	69.50	28.53
HC Mass, grams	11.92	11.24	9.41	9.18
CO Mass, grams	13.58	13.44	16.74	29.08
CO2 Mass, grams	33,660.59	25,599.09	18,436.55	4,380.81
NOx Mass, grams	354.09	217.88	127.27	34.61
Part. Mass, grams	2.913	3.211	3.793	1.542
Fuel, kg (lb)	10.918 (24.07)	8.307 (18.32)	5.987 (13.20)	1.442 (3.18)
KW-HR (hp-hr)	51.58 (69.17)	38.60 (51.77)	25.83 (34.64)	3.58 (4.80)
Filter Number	5778	5779	5980	5981
Weight Gain, mg	1.642	1.810	2.112	0.878
Sample Multiplier	1.774	1.774	1.796	1.756
Blower 1, scf	34,072.3	34,410.2	34,694.8	23,093.5
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	38.108	37.978	37.885	25.215
Gas Meter 2, scf	57.324	57.385	57.215	38.375

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-2-COR
 Date: 11/07/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 7.7%EtOH, EM-4829-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.3 (29.34)	99.3 (29.33)	99.3 (29.34)	99.3 (29.34)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.6 (78.0) / 9.0	25.6 (78.0) / 9.0	25.6 (78.0) / 8.3	25.6 (78.0) / 8.3
Engine Air Dew Pt., °C (°F)	12.3 (54.1)	12.8 (55.1)	12.9 (55.3)	12.8 (55.1)
Engine Air Temp, °C (°F)	22.8 (73.0)	22.9 (73.3)	22.8 (73.0)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	52 / 9.1	53 / 9.5	54 / 9.5	52 / 9.4
NOx Humidity C.F.	.972	.978	.979	.978
Dry-to-Wet C.F.	.970	.974	.978	.986
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	60.63 (2,297.4)	60.78 (2,303.0)	60.91 (2,308.2)	61.10 (2,315.2)
90mm Sample Rate, scmm (scfm)*	0.0347 (1.32)	0.0345 (1.31)	0.0342 (1.30)	0.0349 (1.32)
Total Volume, scm (scf)*	606.6 (22,987)	608.1 (23,043)	609.5 (23,095)	917.0 (34,748)
HC Sample Meter/Range/ppm	0.0/0/20.2	0.0/0/20.4	0.0/0/17.8	0.0/0/17.2
HC Bckgrd Meter/Range/ppm	8.4/100/8.5	7.9/100/8.0	8.5/100/8.6	7.0/100/7.1
CO Sample Meter/Range/ppm (Dry)	27.0/100/26.1	19.1/100/18.3	9.1/100/8.6	9.2/100/8.7
CO Bckgrd Meter/Range/ppm	0.6/100/0.6	0.6/100/0.6	0.6/100/0.6	0.8/100/0.8
CO2 Sample Meter/Range/% (Wet)	84.4/2/1.6792	67.6/2/1.2893	91.2/1/0.8963	15.8/1/0.0959
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	3.4/2/0.0559	8.8/1/0.0518	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/158.1	0.0/0/111.2	0.0/0/74.1	0.0/0/6.1
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	1.3/25/0.3	1.8/25/0.5	0.9/25/0.2
CH4 Sample Meter/Range/ppm	2.1	2.2	2.4	2.4
CH4 Bckgrd Meter/Range/ppm	2.4	2.4	2.7	2.4
Dilution Factor	8.04	10.47	15.07	137.54
HC Concentration, ppm	12.72	13.16	9.75	10.20
CO Concentration, ppm	24.36	17.10	7.85	7.86
CO2 Concentration, %	1.63	1.24	0.85	0.05
NOx Concentration, ppm	153.24	107.95	72.05	5.74
HC Mass, grams	4.78	4.95	3.75	5.79
CO Mass, grams	18.46	12.99	5.98	9.00
CO2 Mass, grams	19,432.14	14,788.95	10,145.86	854.31
NOx Mass, grams	185.37	131.70	88.21	10.56
Part. Mass, grams	1.716	1.455	1.108	0.817
Fuel, kg (lb)	6.306 (13.90)	4.800 (10.58)	3.292 (7.26)	0.287 (0.63)
KW-HR (hp-hr)	31.30 (41.97)	23.74 (31.84)	15.81 (21.20)	0.01 (0.01)
Filter Number	5782	5783	5784	5785
Weight Gain, mg	0.983	0.826	0.622	0.466
Sample Multiplier	1.746	1.761	1.782	1.752
Blower 1, scf	22,973.7	23,030.2	23,081.7	34,727.7
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.247	25.294	25.346	37.991
Gas Meter 2, scf	38.415	38.378	38.308	57.822

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4936-1-COR
 Date: 11/10/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
 HCR: 1.863 FID Resp: 1.00
 H= 0.131 C= 0.838 O= 0.031 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	697.0	900	2,203	697.0	102.6	73.0	9.4	29.36	0.977	1.018	0.966	0.997
2	2,200	75.0	522.8	900	2,200	518.0	77.3	73.2	9.9	29.36	0.986	1.011	0.970	0.998
3	2,200	50.0	348.5	900	2,201	346.0	55.2	73.0	9.7	29.36	0.982	1.014	0.974	0.998
4	2,200	10.0	69.7	600	2,201	72.0	19.5	75.0	9.5	29.35	0.979	1.016	0.981	1.003
5	1,400	100.0	979.0	600	1,400	979.0	85.7	74.0	9.7	29.35	0.982	1.014	0.968	1.001
6	1,400	75.0	734.3	600	1,400	736.0	64.8	75.0	9.8	29.35	0.983	1.013	0.973	1.004
7	1,400	50.0	489.5	600	1,400	492.0	44.7	76.0	9.7	29.35	0.982	1.014	0.975	1.006
8	900	0.0	0.0	900	901	-3.0	2.4	78.5	9.5	29.35	0.979	1.016	0.985	1.013

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	292.1	50.46	0.00	50.46	55.3	1,510.5	11.46	142,660
2	216.9	47.25	0.00	47.25	50.4	919.8	12.54	107,408
3	144.9	39.45	0.00	39.45	66.5	523.1	17.01	76,675
4	29.9	54.08	0.31	53.77	170.3	207.7	9.08	26,727
5	260.3	29.76	0.04	29.72	101.2	1,163.1	10.38	119,049
6	195.8	29.15	0.00	29.15	74.4	817.2	8.82	90,044
7	130.8	24.49	0.40	24.10	33.6	541.7	6.83	62,160
8	0.0	26.67	0.48	26.19	33.4	41.2	3.28	3,243

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
5	.100	26.0	2.98	0.00	2.97	10.12	116.31	1.04	11,905
6	.100	19.6	2.91	0.00	2.91	7.44	81.72	0.88	9,004
7	.100	13.1	2.45	0.04	2.41	3.36	54.17	0.68	6,216
8	.150	0.0	4.00	0.07	3.93	5.01	6.18	0.49	486
1	.150	43.8	7.57	0.00	7.57	8.30	226.58	1.72	21,399
2	.150	32.5	7.09	0.00	7.09	7.56	137.97	1.88	16,111
3	.150	21.7	5.92	0.00	5.92	9.97	78.46	2.55	11,501
4	.100	3.0	5.41	0.03	5.38	17.03	20.77	0.91	2,673
Total		159.8	38.32	0.15	38.18	68.78	722.17	10.15	79,296

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4936-1-COR
 Date: 11/10/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
 HCR: 1.863 FID Resp: 1.00
 H= 0.131 C= 0.838 O= 0.031 X= 0.000

Weighted Modal Contribution							
g/hp-hr							
Mode	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.05	1.42	0.011	134
2	0.04	0.00	0.04	0.05	0.86	0.012	101
3	0.04	0.00	0.04	0.06	0.49	0.016	72
4	0.03	0.00	0.03	0.11	0.13	0.006	17
5	0.02	0.00	0.02	0.06	0.73	0.006	75
6	0.02	0.00	0.02	0.05	0.51	0.006	56
7	0.02	0.00	0.02	0.02	0.34	0.004	39
8	0.03	0.00	0.02	0.03	0.04	0.003	3

Composite Results

BSHC	=	0.24 g/hp-hr	=	0.32 g/kW-hr
BSCO	=	0.43 g/hp-hr	=	0.58 g/kW-hr
BSNOx	=	4.52 g/hp-hr	=	6.06 g/kW-hr
Particulate	=	0.064 g/hp-hr	=	0.085 g/kW-hr
BSCO2	=	496 g/hp-hr	=	666 g/kW-hr
BSFC	=	0.357 lb/hp-hr	=	0.217 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.24 g/hp-hr	=	0.32 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
Engine Desc.: 8.1 L (494 CID) IL6
Engine Cycle: Diesel
Engine S/N: 6081H213452

Test No.: 8.1-4936-1-COR
Date: 11/10/2003 Time:
Program SSDIL: 2.32-R
Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
HCR: 1.863 FID Resp: 1.00
H= 0.131 C= 0.838 O= 0.031 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.4 (29.36)	99.4 (29.36)	99.4 (29.36)	99.4 (29.35)
Dil. Air: Temp, °C (°F) / AH, g/kg	22.8 (73.0) / 9.5	23.9 (75.0) / 9.7	24.4 (76.0) / 9.5	24.4 (76.0) / 9.5
Engine Air Dew Pt., °C (°F)	12.8 (55.0)	13.6 (56.4)	13.2 (55.8)	13.0 (55.4)
Engine Air Temp, °C (°F)	22.8 (73.0)	22.9 (73.2)	22.8 (73.0)	23.9 (75.0)
Engine Air: RH,% / AH, g/kg	53 / 9.4	56 / 9.9	55 / 9.7	51 / 9.5
NOx Humidity C.F.	.977	.986	.982	.979
Dry-to-Wet C.F.	.966	.970	.974	.981
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	59.74 (2,263.7)	59.83 (2,267.2)	60.29 (2,284.7)	60.18 (2,280.5)
90mm Sample Rate, scmm (scfm)*	0.0344 (1.30)	0.0339 (1.28)	0.0336 (1.27)	0.0344 (1.30)
Total Volume, scm (scf)*	896.6 (33,975)	898.0 (34,027)	904.9 (34,290)	602.2 (22,818)
HC Sample Meter/Range/ppm	0.0/0/27.3	0.0/0/26.2	0.0/0/24.4	0.0/0/31.3
HC Bckgrd Meter/Range/ppm	5.6/100/5.7	6.3/100/6.4	7.5/100/7.6	7.3/100/7.4
CO Sample Meter/Range/ppm (Dry)	14.0/100/13.4	13.0/100/12.4	16.7/100/16.0	40.5/100/39.4
CO Bckgrd Meter/Range/ppm	0.3/100/0.3	0.7/100/0.7	0.8/100/0.8	0.8/100/0.8
CO2 Sample Meter/Range/% (Wet)	47.2/6/2.0673	79.5/2/1.5624	60.0/2/1.1227	55.9/1/0.4252
CO2 Bckgrd Meter/Range/%	1.4/6/0.0486	2.7/2/0.0444	2.9/2/0.0477	8.5/1/0.0500
NOx Sample Meter/Range/ppm (Dry)	0.0/0/217.7	0.0/0/130.7	0.0/0/73.7	0.0/0/29.3
NOx Bckgrd Meter/Range/ppm	0.7/25/0.2	0.8/25/0.2	0.5/25/0.1	0.5/25/0.1
CH4 Sample Meter/Range/ppm	1.8	1.8	2.0	2.4
CH4 Bckgrd Meter/Range/ppm	2.4	2.8	2.3	2.3
Dilution Factor	6.53	8.64	12.01	31.31
HC Concentration, ppm	22.50	20.58	17.45	24.15
CO Concentration, ppm	12.35	11.23	14.70	37.73
CO2 Concentration, %	2.03	1.52	1.08	0.38
NOx Concentration, ppm	210.09	126.61	71.72	28.61
HC Mass, grams	12.61	11.81	9.86	9.01
CO Mass, grams	13.84	12.60	16.62	28.38
CO2 Mass, grams	35,665.03	26,851.88	19,168.63	4,454.57
NOx Mass, grams	377.63	229.95	130.76	34.62
Part. Mass, grams	2.815	3.101	4.194	1.490
Fuel, kg (lb)	11.636 (25.66)	8.764 (19.33)	6.262 (13.81)	1.474 (3.25)
KW-HR (hp-hr)	54.45 (73.02)	40.43 (54.22)	27.01 (36.22)	3.72 (4.99)
Filter Number	6003	6004	6005	6006
Weight Gain, mg	1.618	1.754	2.334	0.851
Sample Multiplier	1.740	1.768	1.797	1.751
Blower 1, scf	33,955.5	34,007.6	34,270.9	22,805.3
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	38.208	38.117	38.069	25.412
Gas Meter 2, scf	57.740	57.361	57.153	38.443

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
Engine Desc.: 8.1 L (494 CID) IL6
Engine Cycle: Diesel
Engine S/N: 6081H213452

Test No.: 8.1-4936-1-COR
Date: 11/10/2003 Time:
Program SSDIL: 2.32-R
Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
HCR: 1.863 FID Resp: 1.00
H= 0.131 C= 0.838 O= 0.031 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.4 (29.35)	99.4 (29.35)	99.4 (29.35)	99.4 (29.35)
Dil. Air: Temp, °C (°F) / AH, g/kg	23.9 (75.0) / 9.7	24.4 (76.0) / 9.5	24.4 (76.0) / 10.2	24.4 (76.0) / 8.8
Engine Air Dew Pt., °C (°F)	13.2 (55.8)	13.3 (56.0)	13.2 (55.8)	12.9 (55.3)
Engine Air Temp, °C (°F)	23.3 (74.0)	23.9 (75.0)	24.4 (76.0)	25.8 (78.5)
Engine Air: RH,% / AH, g/kg	53 / 9.7	52 / 9.8	50 / 9.7	45 / 9.5
NOx Humidity C.F.	.982	.983	.982	.979
Dry-to-Wet C.F.	.968	.973	.975	.985
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	59.77 (2,264.9)	59.90 (2,269.9)	60.31 (2,285.3)	60.54 (2,294.2)
90mm Sample Rate, scmm (scfm)*	0.0343 (1.30)	0.0342 (1.30)	0.0341 (1.29)	0.0344 (1.30)
Total Volume, scm (scf)*	598.0 (22,662)	599.4 (22,712)	603.4 (22,866)	908.7 (34,433)
HC Sample Meter/Range/ppm	0.0/0/18.7	0.0/0/19.7	0.0/0/16.7	0.0/0/18.4
HC Bckgrd Meter/Range/ppm	6.0/100/6.1	7.4/100/7.5	6.2/100/6.3	6.6/100/6.7
CO Sample Meter/Range/ppm (Dry)	25.0/100/24.1	18.1/100/17.3	8.4/100/8.0	8.1/100/7.7
CO Bckgrd Meter/Range/ppm	0.4/100/0.4	0.1/100/0.1	0.3/100/0.3	0.2/100/0.2
CO2 Sample Meter/Range/% (Wet)	86.5/2/1.7300	68.7/2/1.3139	92.5/1/0.9182	15.5/1/0.0939
CO2 Bckgrd Meter/Range/%	2.8/2/0.0460	2.6/2/0.0427	8.0/1/0.0469	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/166.3	0.0/0/116.1	0.0/0/76.3	0.0/0/5.9
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	1.3/25/0.3	0.6/25/0.2	0.6/25/0.2
CH4 Sample Meter/Range/ppm	2.0	2.0	2.3	2.5
CH4 Bckgrd Meter/Range/ppm	2.3	2.4	2.3	2.3
Dilution Factor	7.80	10.27	14.70	140.23
HC Concentration, ppm	13.39	12.94	10.90	11.82
CO Concentration, ppm	22.57	16.55	7.43	7.36
CO2 Concentration, %	1.69	1.28	0.87	0.05
NOx Concentration, ppm	160.87	112.64	74.25	5.65
HC Mass, grams	4.96	4.86	4.08	6.67
CO Mass, grams	16.86	12.39	5.60	8.35
CO2 Mass, grams	19,841.42	15,007.29	10,360.03	810.78
NOx Mass, grams	193.85	136.20	90.28	10.30
Part. Mass, grams	1.707	1.452	1.123	0.806
Fuel, kg (lb)	6.476 (14.28)	4.899 (10.80)	3.381 (7.46)	0.275 (0.61)
KW-HR (hp-hr)	32.36 (43.39)	24.33 (32.63)	16.26 (21.80)	0.00 (0.00)
Filter Number	6007	6008	6009	6010
Weight Gain, mg	0.979	0.828	0.634	0.458
Sample Multiplier	1.743	1.754	1.771	1.760
Blower 1, scf	22,649.1	22,699.1	22,853.2	34,413.5
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.422	25.375	25.417	38.187
Gas Meter 2, scf	38.421	38.326	38.327	57.755

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4936-2-COR
 Date: 11/11/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
 HCR: 1.863 FID Resp: 1.00
 H= 0.131 C= 0.838 O= 0.031 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	710.0	900	2,202	710.0	106.3	72.1	9.9	29.24	0.986	1.010	0.964	0.998
2	2,200	75.0	532.5	900	2,200	535.0	81.2	72.7	10.1	29.24	0.989	1.008	0.969	1.000
3	2,200	50.0	355.0	900	2,200	356.0	58.0	73.5	10.2	29.24	0.992	1.006	0.973	1.002
4	2,200	10.0	71.0	600	2,201	74.0	19.7	74.4	9.9	29.25	0.986	1.010	0.980	1.004
5	1,400	100.0	987.0	600	1,401	987.0	88.4	74.3	10.1	29.24	0.988	1.009	0.966	1.005
6	1,400	75.0	740.3	600	1,401	744.0	67.2	75.0	10.1	29.25	0.988	1.009	0.972	1.006
7	1,400	50.0	493.5	600	1,400	496.0	45.5	75.2	10.1	29.25	0.988	1.009	0.976	1.007
8	900	0.0	0.0	900	900	1.0	2.7	77.1	9.5	29.25	0.979	1.016	0.984	1.012

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	297.4	50.38	0.00	50.38	58.0	1,583.1	11.89	147,828
2	224.0	43.18	0.00	43.18	51.0	982.8	12.22	112,903
3	148.9	34.66	0.00	34.66	63.9	548.6	16.73	80,560
4	31.1	45.52	0.03	45.49	164.6	218.2	8.76	27,060
5	262.8	21.65	0.00	21.65	114.0	1,191.3	10.89	122,854
6	198.2	22.56	0.00	22.56	78.5	840.8	8.85	93,313
7	132.1	19.64	0.00	19.64	32.7	554.1	6.80	63,303
8	0.3	20.67	0.14	20.53	31.0	48.3	3.20	3,585

Weighted Results									
Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
5	.100	26.3	2.17	0.00	2.17	11.40	119.13	1.09	12,285
6	.100	19.8	2.26	0.00	2.26	7.85	84.08	0.88	9,331
7	.100	13.2	1.96	0.00	1.96	3.27	55.41	0.68	6,330
8	.150	0.0	3.10	0.02	3.08	4.65	7.25	0.48	538
1	.150	44.6	7.56	0.00	7.56	8.70	237.46	1.78	22,174
2	.150	33.6	6.48	0.00	6.48	7.65	147.41	1.83	16,935
3	.150	22.3	5.20	0.00	5.20	9.59	82.30	2.51	12,084
4	.100	3.1	4.55	0.00	4.55	16.46	21.82	0.88	2,706
Total		162.9	33.27	0.02	33.25	69.59	754.86	10.14	82,384

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4936-2-COR
 Date: 11/11/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
 HCR: 1.863 FID Resp: 1.00
 H= 0.131 C= 0.838 O= 0.031 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.05	1.46	0.011	136
2	0.04	0.00	0.04	0.05	0.90	0.011	104
3	0.03	0.00	0.03	0.06	0.51	0.015	74
4	0.03	0.00	0.03	0.10	0.13	0.005	17
5	0.01	0.00	0.01	0.07	0.73	0.007	75
6	0.01	0.00	0.01	0.05	0.52	0.005	57
7	0.01	0.00	0.01	0.02	0.34	0.004	39
8	0.02	0.00	0.02	0.03	0.04	0.003	3

Composite Results

BSHC	=	0.20 g/hp-hr	=	0.27 g/kW-hr
BSCO	=	0.43 g/hp-hr	=	0.57 g/kW-hr
BSNOx	=	4.63 g/hp-hr	=	6.21 g/kW-hr
Particulate	=	0.062 g/hp-hr	=	0.083 g/kW-hr
BSCO2	=	506 g/hp-hr	=	678 g/kW-hr
BSFC	=	0.364 lb/hp-hr	=	0.221 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.20 g/hp-hr	=	0.27 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4936-2-COR
 Date: 11/11/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
 HCR: 1.863 FID Resp: 1.00
 H= 0.131 C= 0.838 O= 0.031 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.0 (29.24)	99.0 (29.24)	99.0 (29.24)	99.0 (29.25)
Dil. Air: Temp, °C (°F) / AH, g/kg	22.2 (72.0) / 9.8	23.3 (74.0) / 10.0	23.9 (75.0) / 9.7	23.9 (75.0) / 9.7
Engine Air Dew Pt., °C (°F)	13.6 (56.4)	13.8 (56.8)	14.0 (57.2)	13.6 (56.4)
Engine Air Temp, °C (°F)	22.3 (72.1)	22.6 (72.7)	23.1 (73.5)	23.6 (74.4)
Engine Air: RH,% / AH, g/kg	58 / 9.9	57 / 10.1	57 / 10.2	53 / 9.9
NOx Humidity C.F.	.986	.989	.992	.986
Dry-to-Wet C.F.	.964	.969	.973	.980
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	58.61 (2,220.8)	59.03 (2,236.7)	59.48 (2,253.7)	59.83 (2,267.1)
90mm Sample Rate, scmm (scfm)*	0.0337 (1.28)	0.0338 (1.28)	0.0335 (1.27)	0.0340 (1.29)
Total Volume, scm (scf)*	879.6 (33,331)	885.9 (33,569)	892.6 (33,825)	598.6 (22,684)
HC Sample Meter/Range/ppm	0.0/0/28.8	0.0/0/25.0	0.0/0/20.6	0.0/0/26.1
HC Bckgrd Meter/Range/ppm	7.7/100/7.8	6.5/100/6.6	5.5/100/5.6	5.8/100/5.9
CO Sample Meter/Range/ppm (Dry)	14.9/100/14.2	13.0/100/12.4	15.9/100/15.2	38.8/100/37.7
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.3/100/0.3	0.3/100/0.3	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	49.3/6/2.1838	83.8/2/1.6647	63.5/2/1.1987	56.4/1/0.4304
CO2 Bckgrd Meter/Range/%	1.5/6/0.0521	2.9/2/0.0477	3.3/2/0.0543	8.2/1/0.0482
NOx Sample Meter/Range/ppm (Dry)	0.0/0/230.8	0.0/0/141.3	0.0/0/77.8	0.0/0/30.8
NOx Bckgrd Meter/Range/ppm	1.0/25/0.3	0.8/25/0.2	0.9/25/0.2	0.6/25/0.2
CH4 Sample Meter/Range/ppm	1.5	2.0	2.1	2.3
CH4 Bckgrd Meter/Range/ppm	2.8	2.7	2.4	2.3
Dilution Factor	6.18	8.11	11.26	30.99
HC Concentration, ppm	22.25	19.26	15.54	20.46
CO Concentration, ppm	13.20	11.52	14.34	36.68
CO2 Concentration, %	2.14	1.62	1.15	0.38
NOx Concentration, ppm	222.29	136.65	75.51	30.02
HC Mass, grams	12.60	10.79	8.67	7.59
CO Mass, grams	14.51	12.75	15.99	27.43
CO2 Mass, grams	36,956.96	28,225.69	20,139.96	4,510.03
NOx Mass, grams	395.77	245.69	137.16	36.37
Part. Mass, grams	2.942	3.029	4.158	1.445
Fuel, kg (lb)	12.057 (26.59)	9.211 (20.31)	6.577 (14.50)	1.491 (3.29)
KW-HR (hp-hr)	55.44 (74.34)	41.75 (55.99)	27.75 (37.22)	3.87 (5.19)
Filter Number	6012	6124	6125	6126
Weight Gain, mg	1.692	1.734	2.340	0.822
Sample Multiplier	1.739	1.747	1.777	1.758
Blower 1, scf	33,311.5	33,550.2	33,806.2	22,670.7
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	38.045	37.924	37.948	25.364
Gas Meter 2, scf	57.217	57.142	56.986	38.266

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
Engine Desc.: 8.1 L (494 CID) IL6
Engine Cycle: Diesel
Engine S/N: 6081H213452

Test No.: 8.1-4936-2-COR
Date: 11/11/2003 Time:
Program SSDIL: 2.32-R
Cell: 16 Bag Cart: 1

DIESEL 10%EtOH, EM-4836-F
HCR: 1.863 FID Resp: 1.00
H= 0.131 C= 0.838 O= 0.031 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.0 (29.24)	99.0 (29.25)	99.0 (29.25)	99.0 (29.25)
Dil. Air: Temp, °C (°F) / AH, g/kg	23.9 (75.0) / 10.4	24.4 (76.0) / 9.5	24.4 (76.0) / 9.5	24.4 (76.0) / 9.5
Engine Air Dew Pt., °C (°F)	13.7 (56.7)	13.7 (56.7)	13.7 (56.7)	12.9 (55.3)
Engine Air Temp, °C (°F)	23.5 (74.3)	23.9 (75.0)	24.0 (75.2)	25.1 (77.1)
Engine Air: RH,% / AH, g/kg	54 / 10.1	53 / 10.1	53 / 10.1	47 / 9.5
NOx Humidity C.F.	.988	.988	.988	.979
Dry-to-Wet C.F.	.966	.972	.976	.984
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	58.66 (2,222.8)	59.03 (2,237.0)	59.58 (2,257.5)	60.03 (2,274.9)
90mm Sample Rate, scmm (scfm)*	0.0336 (1.27)	0.0336 (1.27)	0.0341 (1.29)	0.0343 (1.30)
Total Volume, scm (scf)*	586.9 (22,241)	590.7 (22,383)	596.1 (22,588)	901.0 (34,144)
HC Sample Meter/Range/ppm	0.0/0/14.0	0.0/0/14.6	0.0/0/14.2	0.0/0/14.7
HC Bckgrd Meter/Range/ppm	4.7/100/4.8	4.8/100/4.9	5.8/100/5.9	5.4/100/5.5
CO Sample Meter/Range/ppm (Dry)	28.5/100/27.5	19.5/100/18.7	8.1/100/7.7	7.5/100/7.1
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.2/100/0.2	0.1/100/0.1	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	90.1/2/1.8182	71.8/2/1.3839	94.1/1/0.9457	16.2/1/0.0985
CO2 Bckgrd Meter/Range/%	2.9/2/0.0477	2.9/2/0.0477	8.1/1/0.0475	8.2/1/0.0482
NOx Sample Meter/Range/ppm (Dry)	0.0/0/172.9	0.0/0/120.6	0.0/0/78.5	0.0/0/6.8
NOx Bckgrd Meter/Range/ppm	1.3/25/0.3	1.2/25/0.3	0.8/25/0.2	0.2/25/0.1
CH4 Sample Meter/Range/ppm	1.9	1.9	1.9	2.2
CH4 Bckgrd Meter/Range/ppm	2.2	2.1	2.2	2.1
Dilution Factor	7.43	9.75	14.28	134.42
HC Concentration, ppm	9.87	10.26	8.74	9.25
CO Concentration, ppm	25.91	17.74	7.33	6.89
CO2 Concentration, %	1.78	1.34	0.90	0.05
NOx Concentration, ppm	166.79	116.97	76.40	6.67
HC Mass, grams	3.61	3.76	3.27	5.17
CO Mass, grams	19.00	13.09	5.46	7.75
CO2 Mass, grams	20,475.71	15,552.22	10,550.51	896.14
NOx Mass, grams	198.55	140.13	92.36	12.08
Part. Mass, grams	1.800	1.462	1.124	0.788
Fuel, kg (lb)	6.683 (14.74)	5.076 (11.19)	3.443 (7.59)	0.301 (0.66)
KW-HR (hp-hr)	32.66 (43.80)	24.63 (33.03)	16.41 (22.01)	0.06 (0.08)
Filter Number	6127	6128	6129	6130
Weight Gain, mg	1.030	0.832	0.643	0.450
Sample Multiplier	1.748	1.757	1.748	1.751
Blower 1, scf	22,228.4	22,370.4	22,575.2	34,124.2
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.318	25.308	25.345	38.032
Gas Meter 2, scf	38.045	38.046	38.268	57.529

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-1-COR
 Date: 11/12/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 15%EtOH, EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.130 C= 0.811 O= 0.059 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	727.0	900	2,200	727.0	112.5	71.7	10.3	29.20	0.993	1.005	0.964	0.998
2	2,200	75.0	545.3	900	2,200	546.0	85.0	72.6	10.5	29.20	0.996	1.003	0.969	1.001
3	2,200	50.0	363.5	900	2,201	365.0	60.1	73.0	10.3	29.21	0.993	1.005	0.973	1.002
4	2,200	10.0	72.7	600	2,201	74.0	20.5	73.2	10.0	29.21	0.986	1.010	0.981	1.002
5	1,400	100.0	991.0	600	1,400	991.0	91.2	74.0	10.1	29.21	0.988	1.009	0.968	1.004
6	1,400	75.0	743.3	600	1,400	746.0	69.0	74.6	10.1	29.21	0.989	1.008	0.971	1.006
7	1,400	50.0	495.5	600	1,401	503.0	47.6	75.0	10.1	29.22	0.989	1.008	0.975	1.007
8	900	0.0	0.0	900	900	-3.0	2.6	77.8	9.7	29.22	0.983	1.013	0.984	1.015

Mode	BHP from Work	Grams/Hour					Weighted Results						
		HC	CO	NOx	Part.	CO2	Mode wf	Power bhp	Grams/Hour				
		HC	CO	NOx	Part.	CO2			HC	CO	NOx	Part.	CO2
1	304.1	44.29	57.2	1,612.9	10.30	151,427	.150	45.6	6.64	8.58	241.94	1.54	22,714
2	228.3	40.74	49.0	960.8	9.63	114,394	.150	34.2	6.11	7.34	144.13	1.44	17,159
3	152.8	33.08	61.8	558.8	13.23	80,744	.150	22.9	4.96	9.26	83.82	1.99	12,112
4	31.1	49.51	198.2	223.4	8.98	27,168	.100	3.1	4.95	19.82	22.34	0.90	2,717
5	263.6	21.50	105.6	1,198.0	9.79	122,656	.100	26.4	2.15	10.56	119.80	0.98	12,266
6	198.4	23.24	66.1	845.3	7.25	92,869	.100	19.8	2.32	6.61	84.53	0.72	9,287
7	133.9	18.37	32.1	572.1	5.98	64,038	.100	13.4	1.84	3.21	57.21	0.60	6,404
8	0.0	17.54	33.2	45.4	3.06	3,353	.150	0.0	2.63	4.98	6.81	0.46	503
Total								165.5	31.61	70.37	760.57	8.63	83,161

Mode	Weighted Modal Contribution g/hp-hr				
	HC	CO	NOx	Part.	CO2
1	0.04	0.05	1.46	0.009	137
2	0.04	0.04	0.87	0.009	104
3	0.03	0.06	0.51	0.012	73
4	0.03	0.12	0.13	0.005	16
5	0.01	0.06	0.72	0.006	74
6	0.01	0.04	0.51	0.004	56
7	0.01	0.02	0.35	0.004	39
8	0.02	0.03	0.04	0.003	3

Composite Results

BSHC = 0.19 g/hp-hr = 0.26 g/kW-hr
 BSCO = 0.43 g/hp-hr = 0.57 g/kW-hr
 BSNOx = 4.60 g/hp-hr = 6.16 g/kW-hr
 Particulate = 0.052 g/hp-hr = 0.070 g/kW-hr
 BSCO2 = 503 g/hp-hr = 674 g/kW-hr
 BSFC = 0.374 lb/hp-hr = 0.227 kg/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-1-COR
 Date: 11/12/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 15%EtOH, EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.130 C= 0.811 O= 0.059 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.9 (29.20)	98.9 (29.20)	98.9 (29.21)	98.9 (29.21)
Dil. Air: Temp, °C (°F) / AH, g/kg	22.2 (72.0) / 9.1	23.3 (74.0) / 9.3	24.4 (76.0) / 9.5	24.4 (76.0) / 9.5
Engine Air Dew Pt., °C (°F)	14.1 (57.4)	14.3 (57.8)	14.1 (57.4)	13.6 (56.4)
Engine Air Temp, °C (°F)	22.1 (71.7)	22.6 (72.6)	22.8 (73.0)	22.9 (73.2)
Engine Air: RH, % / AH, g/kg	61 / 10.3	60 / 10.5	58 / 10.3	56 / 10.0
NOx Humidity C.F.	.993	.996	.993	.986
Dry-to-Wet C.F.	.964	.969	.973	.981
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	58.64 (2,222.0)	58.79 (2,227.6)	59.33 (2,248.4)	59.84 (2,267.7)
90mm Sample Rate, scmm (scfm)*	0.0339 (1.28)	0.0340 (1.29)	0.0337 (1.28)	0.0343 (1.30)
Total Volume, scm (scf)*	880.1 (33,349)	882.3 (33,434)	890.5 (33,745)	598.8 (22,690)
HC Sample Meter/Range/ppm	0.0/0/23.9	0.0/0/22.5	0.0/0/20.2	0.0/0/27.0
HC Bckgrd Meter/Range/ppm	4.3/100/4.4	4.4/100/4.5	5.7/100/5.8	4.9/100/5.0
CO Sample Meter/Range/ppm (Wet)	13.8/100/13.2	12.0/100/11.4	14.8/100/14.1	45.5/100/44.3
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.4/100/0.4	0.3/100/0.3	0.2/100/0.2
CO2 Sample Meter/Range/% (Wet)	50.2/6/2.2345	84.9/2/1.6912	63.4/2/1.1965	56.3/1/0.4294
CO2 Bckgrd Meter/Range/%	1.5/6/0.0521	2.8/2/0.0460	2.8/2/0.0460	7.8/1/0.0457
NOx Sample Meter/Range/ppm (Dry)	0.0/0/233.3	0.0/0/137.6	0.0/0/79.2	0.0/0/31.4
NOx Bckgrd Meter/Range/ppm	0.5/25/0.1	0.8/25/0.2	0.6/25/0.2	0.3/25/0.1
Dilution Factor	6.03	7.97	11.25	30.92
HC Concentration, ppm	20.24	18.57	14.94	22.17
CO Concentration, ppm	13.00	11.10	13.88	44.16
CO2 Concentration, %	2.19	1.65	1.15	0.39
NOx Concentration, ppm	224.79	133.20	76.97	30.71
HC Mass, grams	11.07	10.18	8.27	8.25
CO Mass, grams	14.30	12.24	15.44	33.04
CO2 Mass, grams	37,856.63	28,598.44	20,186.03	4,528.06
NOx Mass, grams	403.23	240.21	139.70	37.23
Part. Mass, grams	2.562	2.400	3.292	1.482
Fuel, kg (lb)	12.760 (28.13)	9.642 (21.26)	6.810 (15.02)	1.550 (3.42)
KW-HR (hp-hr)	56.69 (76.02)	42.56 (57.08)	28.48 (38.19)	3.86 (5.18)
Filter Number	6132	6133	6170	6171
Weight Gain, mg	1.478	1.387	1.870	0.848
Sample Multiplier	1.733	1.730	1.760	1.747
Blower 1, scf	33,329.4	33,414.7	33,725.9	22,677.2
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	38.080	37.888	37.876	25.248
Gas Meter 2, scf	57.321	57.211	57.046	38.233

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-1-COR
 Date: 11/12/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 15%EtOH, EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.130 C= 0.811 O= 0.059 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.9 (29.21)	98.9 (29.21)	98.9 (29.22)	98.9 (29.22)
Dil. Air: Temp, °C (°F) / AH, g/kg	24.4 (76.0) / 9.5	25.0 (77.0) / 10.0	24.4 (76.0) / 10.2	23.9 (75.0) / 9.8
Engine Air Dew Pt., °C (°F)	13.7 (56.7)	13.8 (56.8)	13.8 (56.8)	13.2 (55.8)
Engine Air Temp, °C (°F)	23.3 (74.0)	23.7 (74.6)	23.9 (75.0)	25.4 (77.8)
Engine Air: RH,% / AH, g/kg	55 / 10.1	54 / 10.1	53 / 10.1	47 / 9.7
NOx Humidity C.F.	.988	.989	.989	.983
Dry-to-Wet C.F.	.968	.971	.975	.984
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	58.84 (2,229.7)	59.05 (2,237.8)	59.46 (2,253.1)	59.94 (2,271.4)
90mm Sample Rate, scmm (scfm)*	0.0339 (1.29)	0.0339 (1.29)	0.0342 (1.30)	0.0343 (1.30)
Total Volume, scm (scf)*	588.8 (22,310)	590.9 (22,391)	594.9 (22,544)	899.6 (34,091)
HC Sample Meter/Range/ppm	0.0/0/13.7	0.0/0/14.9	0.0/0/12.7	0.0/0/12.1
HC Bckgrd Meter/Range/ppm	4.5/100/4.6	4.8/100/4.9	4.7/100/4.8	4.2/100/4.3
CO Sample Meter/Range/ppm (Wet)	25.0/100/24.1	15.7/100/15.0	7.7/100/7.3	8.0/100/7.6
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.1/100/0.1	0.1/100/0.1	0.2/100/0.2
CO2 Sample Meter/Range/% (Wet)	89.7/2/1.8084	71.3/2/1.3726	94.8/1/0.9579	15.8/1/0.0959
CO2 Bckgrd Meter/Range/%	2.8/2/0.0460	2.6/2/0.0427	8.1/1/0.0475	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/173.0	0.0/0/121.5	0.0/0/81.3	0.0/0/6.5
NOx Bckgrd Meter/Range/ppm	0.9/25/0.2	2.3/25/0.6	1.0/25/0.3	0.6/25/0.2
Dilution Factor	7.45	9.81	14.06	137.94
HC Concentration, ppm	9.79	10.55	8.28	7.84
CO Concentration, ppm	23.93	14.92	7.21	7.38
CO2 Concentration, %	1.77	1.33	0.91	0.05
NOx Concentration, ppm	167.18	117.46	78.96	6.26
HC Mass, grams	3.58	3.87	3.06	4.38
CO Mass, grams	17.60	11.01	5.36	8.30
CO2 Mass, grams	20,442.70	15,478.15	10,672.99	838.15
NOx Mass, grams	199.67	140.88	95.35	11.35
Part. Mass, grams	1.618	1.198	0.989	0.756
Fuel, kg (lb)	6.893 (15.20)	5.219 (11.51)	3.598 (7.93)	0.291 (0.64)
KW-HR (hp-hr)	32.77 (43.94)	24.65 (33.06)	16.64 (22.32)	0.01 (0.01)
Filter Number	6172	6173	6174	6175
Weight Gain, mg	0.932	0.688	0.568	0.433
Sample Multiplier	1.736	1.742	1.741	1.746
Blower 1, scf	22,297.2	22,377.9	22,531.1	34,071.4
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.319	25.285	25.267	37.952
Gas Meter 2, scf	38.170	38.142	38.219	57.474

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-2-COR
 Date: 11/13/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 15%EtOH, EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.130 C= 0.811 O= 0.059 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,200	100.0	734.0	900	2,204	734.0	113.2	72.0	8.4	29.45	0.960	1.031	0.969	0.991
2	2,200	75.0	550.5	900	2,201	548.0	86.2	72.4	8.5	29.46	0.962	1.030	0.974	0.992
3	2,200	50.0	367.0	900	2,201	366.0	59.9	72.4	8.5	29.46	0.962	1.030	0.979	0.992
4	2,200	10.0	73.4	600	2,201	74.0	20.3	72.7	8.6	29.47	0.963	1.029	0.985	0.993
5	1,400	100.0	993.0	600	1,400	993.0	91.4	72.7	8.7	29.48	0.965	1.027	0.972	0.993
6	1,400	75.0	744.8	600	1,400	749.0	69.1	74.0	8.9	29.48	0.967	1.025	0.977	0.997
7	1,400	50.0	496.5	600	1,401	499.0	47.2	74.3	9.1	29.48	0.971	1.022	0.981	0.998
8	900	0.0	0.0	900	901	6.0	2.8	74.5	9.1	29.48	0.971	1.022	0.991	0.998

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	307.7	45.93	0.00	45.93	58.7	1,659.7	10.83	152,337
2	229.2	41.72	0.00	41.72	50.1	972.1	9.88	115,939
3	153.3	32.02	0.00	32.02	62.1	560.7	13.02	80,480
4	31.1	47.34	0.50	46.84	187.7	219.9	8.85	26,957
5	264.1	21.82	0.00	21.82	98.1	1,210.2	9.76	122,964
6	199.4	21.96	0.00	21.96	60.8	851.1	7.16	92,951
7	132.8	16.49	0.00	16.49	30.6	566.3	6.20	63,508
8	1.0	15.07	0.00	15.07	35.5	49.1	3.21	3,688

Weighted Results									
Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
5	.100	26.4	2.18	0.00	2.18	9.81	121.02	0.98	12,296
6	.100	19.9	2.20	0.00	2.20	6.08	85.11	0.72	9,295
7	.100	13.3	1.65	0.00	1.65	3.06	56.63	0.62	6,351
8	.150	0.1	2.26	0.00	2.26	5.33	7.37	0.48	553
1	.150	46.2	6.89	0.00	6.89	8.80	248.95	1.62	22,851
2	.150	34.4	6.26	0.00	6.26	7.51	145.82	1.48	17,391
3	.150	23.0	4.80	0.00	4.80	9.32	84.10	1.95	12,072
4	.100	3.1	4.73	0.05	4.68	18.77	21.99	0.89	2,696
Total		166.3	30.97	0.05	30.92	68.67	770.98	8.74	83,505

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-2-COR
 Date: 11/13/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 15%EtOH, EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.130 C= 0.811 O= 0.059 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.04	0.00	0.04	0.05	1.50	0.010	137
2	0.04	0.00	0.04	0.05	0.88	0.009	105
3	0.03	0.00	0.03	0.06	0.51	0.012	73
4	0.03	0.00	0.03	0.11	0.13	0.005	16
5	0.01	0.00	0.01	0.06	0.73	0.006	74
6	0.01	0.00	0.01	0.04	0.51	0.004	56
7	0.01	0.00	0.01	0.02	0.34	0.004	38
8	0.01	0.00	0.01	0.03	0.04	0.003	3

Composite Results

BSHC	=	0.19 g/hp-hr	=	0.25 g/kW-hr
BSCO	=	0.41 g/hp-hr	=	0.55 g/kW-hr
BSNOx	=	4.64 g/hp-hr	=	6.22 g/kW-hr
Particulate	=	0.053 g/hp-hr	=	0.070 g/kW-hr
BSCO2	=	502 g/hp-hr	=	674 g/kW-hr
BSFC	=	0.374 lb/hp-hr	=	0.227 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.19 g/hp-hr	=	0.25 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-2-COR
 Date: 11/13/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

DIESEL 15%EtOH, EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.130 C= 0.811 O= 0.059 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.7 (29.45)	99.8 (29.46)	99.8 (29.46)	99.8 (29.47)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.6 (78.0) / 6.3	26.7 (80.0) / 6.5	27.8 (82.0) / 6.0	27.2 (81.0) / 6.9
Engine Air Dew Pt., °C (°F)	11.2 (52.1)	11.3 (52.4)	11.3 (52.4)	11.5 (52.7)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.4 (72.4)	22.4 (72.4)	22.6 (72.7)
Engine Air: RH,% / AH, g/kg	50 / 8.4	49 / 8.5	49 / 8.5	49 / 8.6
NOx Humidity C.F.	.960	.962	.962	.963
Dry-to-Wet C.F.	.969	.974	.979	.985
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	59.29 (2,246.7)	59.86 (2,268.4)	60.20 (2,281.1)	61.07 (2,314.0)
90mm Sample Rate, scmm (scfm)*	0.0344 (1.30)	0.0345 (1.31)	0.0341 (1.29)	0.0345 (1.31)
Total Volume, scm (scf)*	889.9 (33,720)	898.5 (34,046)	903.5 (34,235)	611.0 (23,153)
HC Sample Meter/Range/ppm	0.0/0/25.1	0.0/0/22.4	0.0/0/18.2	0.0/0/26.2
HC Bckgrd Meter/Range/ppm	5.4/100/5.5	4.4/100/4.5	4.4/100/4.5	5.6/100/5.7
CO Sample Meter/Range/ppm (Wet)	14.0/100/13.4	11.8/100/11.2	14.5/100/13.8	42.3/100/41.2
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.1/100/0.1	0.1/100/0.1	0.2/100/0.2
CO2 Sample Meter/Range/% (Wet)	49.9/6/2.2176	84.4/2/1.6792	62.2/2/1.1703	55.0/1/0.4159
CO2 Bckgrd Meter/Range/%	1.3/6/0.0451	2.5/2/0.0411	2.4/2/0.0394	7.3/1/0.0427
NOx Sample Meter/Range/ppm (Dry)	0.0/0/244.4	0.0/0/140.9	0.0/0/80.4	0.0/0/30.9
NOx Bckgrd Meter/Range/ppm	0.5/25/0.1	0.4/25/0.1	0.5/25/0.1	0.4/25/0.1
CH4 Sample Meter/Range/ppm	1.5	1.6	1.7	2.2
CH4 Bckgrd Meter/Range/ppm	2.1	2.0	2.0	2.1
Dilution Factor	6.08	8.02	11.50	31.94
HC Concentration, ppm	20.49	18.48	14.09	20.75
CO Concentration, ppm	13.19	11.15	13.76	40.99
CO2 Concentration, %	2.18	1.64	1.13	0.37
NOx Concentration, ppm	236.66	137.08	78.62	30.34
HC Mass, grams	11.48	10.43	8.00	7.89
CO Mass, grams	14.67	12.52	15.53	31.29
CO2 Mass, grams	38,084.25	28,984.86	20,119.88	4,492.84
NOx Mass, grams	414.91	243.03	140.17	36.64
Part. Mass, grams	2.625	2.397	3.160	1.434
Fuel, kg (lb)	12.837 (28.31)	9.772 (21.55)	6.788 (14.97)	1.537 (3.39)
KW-HR (hp-hr)	57.36 (76.92)	42.72 (57.29)	28.58 (38.33)	3.87 (5.19)
Filter Number	6177	6274	6265	6266
Weight Gain, mg	1.523	1.379	1.788	0.810
Sample Multiplier	1.724	1.738	1.767	1.771
Blower 1, scf	33,700.7	34,026.0	34,215.9	23,140.2
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	38.056	37.948	37.941	25.302
Gas Meter 2, scf	57.620	57.533	57.312	38.377

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
Engine Desc.: 8.1 L (494 CID) IL6
Engine Cycle: Diesel
Engine S/N: 6081H213452

Test No.: 8.1-4951-2-COR
Date: 11/13/2003 Time:
Program SSDIL: 2.32-R
Cell: 16 Bag Cart: 1

DIESEL 15%EtOH, EM-4851-F
HCR: 1.910 FID Resp: 1.00
H= 0.130 C= 0.811 O= 0.059 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.8 (29.48)	99.8 (29.48)	99.8 (29.48)	99.8 (29.48)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.2 (81.0) / 6.9	28.9 (84.0) / 6.2	28.9 (84.0) / 6.2	28.3 (83.0) / 5.1
Engine Air Dew Pt., °C (°F)	11.7 (53.1)	11.9 (53.5)	12.3 (54.1)	12.3 (54.2)
Engine Air Temp, °C (°F)	22.6 (72.7)	23.3 (74.0)	23.5 (74.3)	23.6 (74.5)
Engine Air: RH,% / AH, g/kg	50 / 8.7	49 / 8.9	49 / 9.1	49 / 9.1
NOx Humidity C.F.	.965	.967	.971	.971
Dry-to-Wet C.F.	.972	.977	.981	.991
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	59.98 (2,272.9)	60.13 (2,278.6)	60.51 (2,293.0)	60.91 (2,308.1)
90mm Sample Rate, scmm (scfm)*	0.0344 (1.30)	0.0345 (1.31)	0.0349 (1.32)	0.0347 (1.32)
Total Volume, scm (scf)*	600.2 (22,742)	601.7 (22,800)	605.5 (22,943)	914.2 (34,642)
HC Sample Meter/Range/ppm	0.0/0/16.2	0.0/0/15.8	0.0/0/12.5	0.0/0/12.4
HC Bckgrd Meter/Range/ppm	7.4/100/7.5	6.7/100/6.8	5.7/100/5.8	5.8/100/5.9
CO Sample Meter/Range/ppm (Wet)	23.0/100/22.1	14.2/100/13.6	7.3/100/6.9	8.5/100/8.1
CO Bckgrd Meter/Range/ppm	0.4/100/0.4	0.1/100/0.1	0.2/100/0.2	0.3/100/0.3
CO2 Sample Meter/Range/% (Wet)	88.4/2/1.7764	70.3/2/1.3499	93.5/1/0.9353	16.4/1/0.0998
CO2 Bckgrd Meter/Range/%	2.6/2/0.0427	2.6/2/0.0427	8.2/1/0.0482	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/174.7	0.0/0/121.7	0.0/0/79.9	0.0/0/7.0
NOx Bckgrd Meter/Range/ppm	0.7/25/0.2	0.8/25/0.2	0.6/25/0.2	0.9/25/0.2
CH4 Sample Meter/Range/ppm	1.8	1.8	1.9	2.1
CH4 Bckgrd Meter/Range/ppm	2.1	2.1	2.3	2.2
Dilution Factor	7.58	9.98	14.40	132.55
HC Concentration, ppm	9.72	9.66	7.09	6.54
CO Concentration, ppm	21.80	13.47	6.73	7.77
CO2 Concentration, %	1.74	1.31	0.89	0.05
NOx Concentration, ppm	169.65	118.74	78.24	6.74
HC Mass, grams	3.64	3.66	2.75	3.77
CO Mass, grams	16.35	10.13	5.09	8.88
CO2 Mass, grams	20,494.04	15,491.78	10,584.62	921.95
NOx Mass, grams	201.69	141.85	94.39	12.28
Part. Mass, grams	1.585	1.164	1.010	0.785
Fuel, kg (lb)	6.910 (15.24)	5.223 (11.52)	3.568 (7.87)	0.319 (0.70)
KW-HR (hp-hr)	32.82 (44.01)	24.78 (33.23)	16.50 (22.13)	0.18 (0.24)
Filter Number	6267	6268	6269	6270
Weight Gain, mg	0.908	0.668	0.582	0.447
Sample Multiplier	1.745	1.742	1.736	1.756
Blower 1, scf	22,729.1	22,786.5	22,930.0	34,621.9
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	25.306	25.296	25.195	37.957
Gas Meter 2, scf	38.338	38.381	38.409	57.689

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-2-COR
 Date: 11/7
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 7.7%EtOH EM-4829-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	650.0	900	2200	661.0	216	96.3	211.7	72.0	9.2	29.31	0.974	1.020	0.968	0.995
2	2200	75	488.0	900	2200	495.0	223.9	73.3	215.3	72.4	9.1	29.32	0.972	1.021	0.972	0.996
3	2200	50	325.0	900	2199	331.0	235.2	52.8	231.8	73.2	9.2	29.32	0.974	1.020	0.976	0.999
4	2200	10	65.0	600	2200	69.0	382.0	19.1	403.4	72.0	9.0	29.33	0.969	1.024	0.982	0.995
5	1400	100	955.0	600	1400	947.0	207.8	83.4	201.5	73.0	9.1	29.34	0.972	1.022	0.970	0.997
6	1400	75	716.0	600	1400	718.0	205.6	63.5	202.2	73.3	9.5	29.33	0.978	1.017	0.974	0.999
7	1400	50	478.0	600	1400	478.0	206.4	43.6	208.5	73.0	9.5	29.34	0.979	1.016	0.978	0.998
8	900	0	0.0	900	901	-1.0	11405.2	2.5	38017.3	74.0	9.4	29.34	0.978	1.017	0.986	1.001

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	276.7	47.69	54.3	1416.4	11.88	134,642	1.0	276.7	0.172	0.196	5.119	0.043	487
2	207.1	44.96	53.7	871.5	13.12	102,396	1.0	207.1	0.217	0.260	4.209	0.063	494
3	138.6	37.63	66.9	509.1	15.47	73,746	1.0	138.6	0.272	0.483	3.674	0.112	532
4	28.8	55.11	174.5	207.6	9.47	26,285	1.0	28.8	1.913	6.058	7.210	0.329	913
5	251.8	28.70	110.8	1112.2	10.52	116,593	1.0	251.8	0.114	0.440	4.417	0.042	463
6	191.0	29.73	78.0	790.2	8.88	88,734	1.0	191.0	0.156	0.408	4.136	0.046	464
7	127.2	22.50	35.9	529.2	6.76	60,875	1.0	127.2	0.177	0.282	4.161	0.053	479
8	0.0	23.16	36.0	42.2	3.32	3,417	1.0	0.0	579.048	900.084	1055.805	83.048	85431

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4929-1-COR
 Date: 11/6
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 7.7%EtOH EM-4929-F
 HCR: 1.852 FID Resp: 1.00
 H= 0.131 C= 0.843 O= 0.026 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	688.0	900	2201	688.0	216	99.4	209.8	72.0	9.7	29.25	0.982	1.013	0.963	0.997
2	2200	75	516.0	900	2201	516.0	221.8	77.8	219.2	72.5	9.7	29.26	0.982	1.013	0.970	0.999
3	2200	50	344.0	900	2200	345.0	233.8	55.3	232.8	72.4	9.7	29.27	0.982	1.013	0.975	0.998
4	2200	10	69.0	600	2200	71.0	376.6	18.8	386.6	74.0	9.5	29.28	0.979	1.016	0.980	1.002
5	1400	100	978.0	600	1399	965.0	207.1	83.7	198.4	73.3	9.6	29.28	0.980	1.015	0.969	1.000
6	1400	75	734.0	600	1400	735.0	205.2	63.7	198.0	74.3	9.7	29.28	0.982	1.013	0.973	1.003
7	1400	50	489.0	600	1400	489.0	206.0	43.5	203.2	74.9	9.6	29.18	0.980	1.015	0.975	1.007
8	900	0	0.0	900	901	0.0	0.0	2.5	38017.3	75.8	9.5	29.28	0.978	1.017	0.984	1.007

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	288.2	48.27	56.3	1501.2	11.68	139,051	1.0	288.2	0.167	0.195	5.209	0.041	482
2	215.9	44.66	53.2	927.5	10.36	108,742	1.0	215.9	0.207	0.247	4.295	0.048	504
3	144.5	37.65	63.6	530.0	16.07	77,255	1.0	144.5	0.261	0.440	3.668	0.111	535
4	29.6	51.86	163.7	213.1	9.32	25,963	1.0	29.6	1.753	5.535	7.204	0.315	878
5	256.6	23.77	118.0	1139.6	10.87	116,920	1.0	256.6	0.093	0.460	4.441	0.042	456
6	195.7	31.20	85.9	811.8	9.16	88,988	1.0	195.7	0.159	0.439	4.149	0.047	455
7	130.2	20.98	35.0	527.7	7.02	60,853	1.0	130.2	0.161	0.269	4.053	0.054	467
8	0.0	24.70	32.9	46.3	3.22	3,376	1.0	0.0	517.400	822.192	1157.183	80.492	84389

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4936-1-COR
 Date: 11/10
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 10%EtOH EM-4836-F
 HCR: 1.863 FID Resp: 1.00
 H= 0.131 C= 0.838 O= 0.031 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	690.0	900	2203	697.0	217	102.6	213.7	73.0	9.4	29.36	0.977	1.018	0.966	0.997
2	2200	75	517.0	900	2200	518.0	224.2	77.3	216.8	73.2	9.9	29.36	0.986	1.011	0.970	0.998
3	2200	50	345.0	900	2201	346.0	237.2	55.2	231.8	73.0	9.7	29.36	0.982	1.014	0.974	0.998
4	2200	10	69.0	600	2201	72.0	383.6	19.5	396.2	75.0	9.5	29.35	0.979	1.016	0.981	1.003
5	1400	100	980.0	600	1400	979.0	206.0	85.7	200.2	74.0	9.7	29.35	0.982	1.014	0.968	1.001
6	1400	75	735.0	600	1400	736.0	205.9	64.8	201.3	75.0	9.8	29.35	0.983	1.013	0.973	1.004
7	1400	50	490.0	600	1400	492.0	208.7	44.7	207.9	76.0	9.7	29.35	0.982	1.014	0.975	1.006
8	900	0	0.0	900	901	-3.0	45468.7	2.4	#####	78.5	9.5	29.35	0.979	1.016	0.985	1.013

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	292.1	50.46	55.3	1510.5	11.46	142,660	1.0	292.1	0.173	0.189	5.172	0.039	488
2	216.9	47.25	50.4	919.8	12.54	107,408	1.0	216.9	0.218	0.232	4.241	0.058	495
3	144.9	39.45	66.5	523.1	17.01	76,675	1.0	144.9	0.272	0.459	3.610	0.117	529
4	29.9	54.08	170.3	207.7	9.08	26,727	1.0	29.9	1.806	5.688	6.939	0.303	893
5	260.3	29.76	101.2	1163.1	10.38	119,049	1.0	260.3	0.114	0.389	4.468	0.040	457
6	195.8	29.15	74.4	817.2	8.82	90,044	1.0	195.8	0.149	0.380	4.174	0.045	460
7	130.8	24.49	33.6	541.7	6.83	62,160	1.0	130.8	0.187	0.257	4.141	0.052	475
8	0.0	26.67	33.4	41.2	3.28	3,243	1.0	0.0	367.865	1354.070	0304.383	818.966	810782

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4936-2-COR
 Date: 11/11
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 10%EtOH EM-4836-F
 HCR: 1.863 FID Resp: 1.00
 H= 0.131 C= 0.838 O= 0.031 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	710.0	900	2202	710.0	215	106.3	217.4	72.1	9.9	29.24	0.986	1.010	0.964	0.998
2	2200	75	533.0	900	2200	535.0	223.7	81.2	220.5	72.7	10.1	29.24	0.989	1.008	0.969	1.000
3	2200	50	355.0	900	2200	356.0	235.8	58.0	237.0	73.5	10.2	29.24	0.992	1.006	0.973	1.002
4	2200	10	71.0	600	2201	74.0	374.1	19.7	384.8	74.4	9.9	29.25	0.986	1.010	0.980	1.004
5	1400	100	990.0	600	1401	987.0	208.0	88.4	204.6	74.3	10.1	29.24	0.988	1.009	0.966	1.005
6	1400	75	743.0	600	1401	744.0	208.3	67.2	206.3	75.0	10.1	29.25	0.988	1.009	0.972	1.006
7	1400	50	495.0	600	1400	496.0	211.9	45.5	209.6	75.2	10.1	29.25	0.988	1.009	0.976	1.007
8	900	0	0.0	900	900	1.0	2828.5	2.7	5132.3	77.1	9.5	29.25	0.979	1.016	0.984	1.012

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	297.4	50.38	58.0	1583.1	11.89	147,828	1.0	297.4	0.169	0.195	5.324	0.040	497
2	224.0	43.18	51.0	982.8	12.22	112,903	1.0	224.0	0.193	0.228	4.388	0.055	504
3	148.9	34.66	63.9	548.6	16.73	80,560	1.0	148.9	0.233	0.430	3.685	0.112	541
4	31.1	45.52	164.6	218.2	8.76	27,060	1.0	31.1	1.462	5.285	7.007	0.281	869
5	262.8	21.65	114.0	1191.3	10.89	122,854	1.0	262.8	0.082	0.434	4.533	0.041	467
6	198.2	22.56	78.5	840.8	8.85	93,313	1.0	198.2	0.114	0.396	4.242	0.045	471
7	132.1	19.64	32.7	554.1	6.80	63,303	1.0	132.1	0.149	0.248	4.196	0.052	479
8	0.3	20.67	31.0	48.3	3.20	3,585	1.0	0.3	64.598	96.916	151.017	10.006	11202

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-1-COR
 Date: 11/12
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 15%EtOH EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.13 C= 0.811 O= 0.059 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	723.0	900	2200	727.0	219	112.5	225.0	71.7	10.3	29.20	0.993	1.005	0.964	0.998
2	2200	75	542.0	900	2200	546.0	228.7	85.0	226.5	72.6	10.5	29.20	0.996	1.003	0.969	1.001
3	2200	50	362.0	900	2201	365.0	239.3	60.1	239.3	73.0	10.3	29.21	0.993	1.005	0.973	1.002
4	2200	10	72.0	600	2201	74.0	377.0	20.5	401.2	73.2	10.0	29.21	0.986	1.010	0.981	1.002
5	1400	100	995.0	600	1400	991.0	211.9	91.2	210.4	74.0	10.1	29.21	0.988	1.009	0.968	1.004
6	1400	75	746.0	600	1400	746.0	210.8	69.0	211.6	74.6	10.1	29.21	0.989	1.008	0.971	1.006
7	1400	50	498.0	600	1401	503.0	211.4	47.6	216.2	75.0	10.1	29.22	0.989	1.008	0.975	1.007
8	900	0	0.0	900	900	-3.0	15495.9	2.6	39538.0	77.8	9.7	29.22	0.983	1.013	0.984	1.015

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	304.1	44.29	57.2	1612.9	10.30	151,427	1.0	304.1	0.146	0.188	5.304	0.034	498
2	228.3	40.74	49.0	960.8	9.63	114,394	1.0	228.3	0.178	0.214	4.208	0.042	501
3	152.8	33.08	61.8	558.8	13.23	80,744	1.0	152.8	0.217	0.404	3.658	0.087	529
4	31.1	49.51	198.2	223.4	8.98	27,168	1.0	31.1	1.593	6.377	7.187	0.289	874
5	263.6	21.50	105.6	1198.0	9.79	122,656	1.0	263.6	0.082	0.401	4.544	0.037	465
6	198.4	23.24	66.1	845.3	7.25	92,869	1.0	198.4	0.117	0.333	4.261	0.037	468
7	133.9	18.37	32.1	572.1	5.98	64,038	1.0	133.9	0.137	0.240	4.272	0.045	478
8	0.0	17.54	33.2	45.4	3.06	3,353	1.0	0.0	438.454	830.003	1135.002	76.607	83815

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4951-2-COR
 Date: 11/13
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 15%EtOH EM-4851-F
 HCR: 1.910 FID Resp: 1.00
 H= 0.13 C= 0.811 O= 0.059 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	730.0	900	2204	734.0	218	113.2	223.8	72.0	8.4	29.45	0.960	1.031	0.969	0.991
2	2200	75	548.0	900	2201	548.0	226.3	86.2	228.8	72.4	8.5	29.46	0.962	1.030	0.974	0.992
3	2200	50	365.0	900	2201	366.0	234.3	59.9	237.6	72.4	8.5	29.46	0.962	1.030	0.979	0.992
4	2200	10	73.0	600	2201	74.0	377.9	20.3	396.5	72.7	8.6	29.47	0.963	1.029	0.985	0.993
5	1400	100	995.0	600	1400	993.0	208.4	91.4	210.5	72.7	8.7	29.48	0.965	1.027	0.972	0.993
6	1400	75	746.0	600	1400	749.0	207.8	69.1	210.8	74.0	8.9	29.48	0.967	1.025	0.977	0.997
7	1400	50	498.0	600	1401	499.0	210.0	47.2	216.2	74.3	9.1	29.48	0.971	1.022	0.981	0.998
8	900	0	0.0	900	901	6.0	333.3	2.8	1774.1	74.5	9.1	29.48	0.971	1.022	0.991	0.998

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	307.7	45.93	58.7	1659.7	10.83	152,337	1.0	307.7	0.149	0.191	5.394	0.035	495
2	229.2	41.72	50.1	972.1	9.88	115,939	1.0	229.2	0.182	0.219	4.242	0.043	506
3	153.3	32.02	62.1	560.7	13.02	80,480	1.0	153.3	0.209	0.405	3.657	0.085	525
4	31.1	47.34	187.7	219.9	8.85	26,957	1.0	31.1	1.520	6.029	7.060	0.284	866
5	264.1	21.82	98.1	1210.2	9.76	122,964	1.0	264.1	0.083	0.371	4.583	0.037	466
6	199.4	21.96	60.8	851.1	7.16	92,951	1.0	199.4	0.110	0.305	4.269	0.036	466
7	132.8	16.49	30.6	566.3	6.20	63,508	1.0	132.8	0.124	0.230	4.265	0.047	478
8	1.0	15.07	35.5	49.1	3.21	3,688	1.0	1.0	15.695	36.996	51.178	3.342	3841

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-1-COR
 Date: 11/4
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	717.0	900	2200	718.0	212	103.9	210.4	72.0	10.3	29.02	0.993	1.005	0.965	1.004
2	2200	75	538.0	900	2200	537.0	220.3	79.5	215.2	72.3	10.4	29.03	0.994	1.004	0.970	1.004
3	2200	50	359.0	900	2200	359.0	229.9	55.8	226.3	73.0	10.3	29.03	0.993	1.005	0.973	1.006
4	2200	10	72.0	600	2201	74.0	363.2	19.1	373.8	74.1	10.2	29.02	0.990	1.007	0.981	1.009
5	1400	100	1030.0	600	1401	1028.0	201.2	88.5	196.7	74.0	10.4	29.03	0.994	1.004	0.967	1.009
6	1400	75	773.0	600	1400	772.0	201.4	67.3	199.2	74.7	10.3	29.02	0.993	1.005	0.970	1.011
7	1400	50	515.0	600	1400	515.0	204.7	46.0	204.0	76.4	10.3	29.02	0.993	1.005	0.973	1.016
8	900	0	0.0	900	900	2.0	0.0	2.6	5648.3	77.1	9.6	29.02	0.981	1.015	0.983	1.017

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	300.3	50.13	71.7	1541.5	14.58	149,602	1.0	300.3	0.167	0.239	5.133	0.049	498
2	224.7	46.12	59.5	943.3	16.25	114,480	1.0	224.7	0.205	0.265	4.198	0.072	510
3	150.0	34.78	66.9	549.0	20.54	80,293	1.0	150.0	0.232	0.446	3.660	0.137	535
4	31.1	43.24	167.3	229.0	9.72	27,181	1.0	31.1	1.391	5.384	7.367	0.313	875
5	273.7	20.73	148.7	1234.2	14.20	127,282	1.0	273.7	0.076	0.544	4.510	0.052	465
6	205.5	21.95	117.6	869.4	12.71	96,875	1.0	205.5	0.107	0.572	4.231	0.062	471
7	137.2	17.78	39.6	569.6	8.70	66,241	1.0	137.2	0.130	0.289	4.153	0.063	483
8	0.3	14.26	31.2	52.9	3.11	3,599	1.0	0.3	50.913	111.532	188.884	11.122	12855

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2002 Deere 8.1L
 Engine Desc.: 8.1 L (494 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6081H213452

Test No.: 8.1-4970-2-COR
 Date: 11/5
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1

Time: DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

Mode	Target				Measured				C-B	C-B	Intake Air			Factors		
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2200	100	715.0	900	2199	717.0	212	101.4	205.6	72.0	10.4	29.09	0.994	1.005	0.963	1.002
2	2200	75	536.0	900	2200	536.0	218.4	80.2	217.7	72.7	10.5	29.09	0.997	1.002	0.968	1.004
3	2200	50	358.0	900	2200	358.0	230.4	54.3	220.3	73.0	10.5	29.10	0.997	1.003	0.973	1.005
4	2200	10	72.0	600	2201	74.0	364.5	18.8	370.8	74.0	10.1	29.11	0.989	1.008	0.979	1.007
5	1400	100	1030.0	600	1401	1029.0	203.7	88.3	196.1	74.0	10.4	29.12	0.994	1.005	0.967	1.007
6	1400	75	773.0	600	1400	774.0	200.9	66.4	196.2	75.1	10.3	29.11	0.992	1.006	0.970	1.010
7	1400	50	515.0	600	1402	516.0	201.0	45.3	200.3	76.2	10.3	29.11	0.992	1.006	0.973	1.013
8	900	0	0.0	900	901	2.0	505.2	2.6	4393.1	77.8	9.6	29.11	0.980	1.015	0.982	1.017

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	300.0	48.68	69.2	1538.9	13.89	145,937	1.0	300.0	0.162	0.231	5.130	0.046	486
2	224.1	44.50	57.3	923.2	15.61	115,467	1.0	224.1	0.199	0.256	4.119	0.070	515
3	149.9	35.85	66.8	543.8	19.73	78,163	1.0	149.9	0.239	0.445	3.627	0.132	521
4	30.8	46.32	168.3	224.8	9.30	26,698	1.0	30.8	1.502	5.459	7.288	0.302	866
5	273.9	22.62	143.8	1221.7	14.04	127,060	1.0	273.9	0.083	0.525	4.461	0.051	464
6	205.9	24.02	119.0	861.4	12.59	95,486	1.0	205.9	0.117	0.578	4.185	0.061	464
7	137.6	22.34	41.3	564.3	8.58	65,211	1.0	137.6	0.162	0.301	4.102	0.062	474
8	0.4	18.16	30.4	53.6	3.18	3,600	1.0	0.4	50.444	84.568	148.773	8.827	10000

APPENDIX C

DETAILED EMISSIONS DATA FOR 6.8-L ENGINE

APPENDIX C
TABLE OF CONTENTS

<u>TEST NO.</u>	<u>FUEL TYPE</u>	<u>PAGE</u>
68-4970-1	Baseline	C-1 – C-4
68-4970-2	Baseline	C-5 – C-8
68-4930-1	7.7% Ethanol	C-9 – C-12
68-4930-2	7.7% Ethanol	C-13 – C-16
68-4937-1	10% Ethanol	C-17 – C-20
68-4937-2	10% Ethanol	C-21 – C-24
68-4949-1	15% Ethanol	C-25 – C-28
68-4949-2	15% Ethanol	C-29 – C-32

UNWEIGHTED 8-MODE TEST RESULTS

68-4970-1	Baseline	C-33
68-4970-2	Baseline	C-34
68-4930-1	7.7% Ethanol	C-35
68-4930-2	7.7% Ethanol	C-36
68-4937-1	10% Ethanol	C-37
68-4937-2	10% Ethanol	C-38
68-4949-1	15% Ethanol	C-39
68-4949-2	15% Ethanol	C-40

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 8.1L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 BASELINE FUEL 20X20

Test No.: 68-4970-1-CORR
 Date: 11/25/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 RUN 63

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	449.0	900	2,000	449.0	59.5	70.9	8.2	29.14	0.956	1.035	0.981	0.995
2	2,000	75.0	336.8	900	2,002	338.0	45.6	72.0	8.2	29.14	0.956	1.035	0.984	0.998
3	2,000	50.0	224.5	900	2,001	226.0	32.1	72.0	8.5	29.13	0.961	1.031	0.987	0.999
4	2,000	10.0	44.9	600	2,000	45.0	11.6	72.0	8.4	29.13	0.959	1.032	0.991	0.999
5	1,400	100.0	530.0	600	1,400	530.0	48.2	72.0	8.5	29.12	0.961	1.031	0.984	0.999
6	1,400	75.0	397.5	600	1,398	400.0	36.8	73.0	8.5	29.12	0.962	1.030	0.985	1.002
7	1,400	50.0	265.0	600	1,401	266.0	24.6	74.0	8.6	29.11	0.963	1.029	0.986	1.005
8	809	0.0	0.0	900	809	0.0	2.1	76.0	8.8	29.11	0.967	1.025	0.990	1.011

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	171.0	42.74	0.00	42.74	47.3	641.3	28.10	85,642
2	128.7	38.55	0.00	38.55	43.0	448.8	13.57	65,631
3	86.1	37.81	0.10	37.70	79.9	315.7	9.00	46,079
4	16.9	57.01	0.54	56.47	147.3	127.3	6.90	16,264
5	141.2	24.24	0.06	24.18	58.0	565.5	34.47	69,363
6	106.3	23.31	0.00	23.31	26.3	420.9	16.41	53,014
7	70.9	19.96	0.00	19.96	36.9	300.8	8.44	35,286
8	0.3	11.70	0.14	11.56	22.4	28.8	2.08	2,908

Weighted Results									
Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	25.6	6.41	0.00	6.41	7.10	96.20	4.22	12,846
2	.150	19.3	5.78	0.00	5.78	6.45	67.32	2.04	9,845
3	.150	12.9	5.67	0.02	5.66	11.98	47.36	1.35	6,912
4	.100	1.7	5.70	0.05	5.65	14.73	12.73	0.69	1,626
5	.100	14.1	2.42	0.01	2.42	5.80	56.55	3.45	6,936
6	.100	10.6	2.33	0.00	2.33	2.63	42.09	1.64	5,301
7	.100	7.1	2.00	0.00	2.00	3.69	30.08	0.84	3,529
8	.150	0.0	1.75	0.02	1.73	3.36	4.32	0.31	436
Total		91.4	32.07	0.10	31.98	55.74	356.65	14.53	47,432

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 8.1L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 BASELINE FUEL 20X20

Test No.: 68-4970-1-CORR
 Date: 11/25/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 RUN 63

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.07	0.00	0.07	0.08	1.05	0.046	141
2	0.06	0.00	0.06	0.07	0.74	0.022	108
3	0.06	0.00	0.06	0.13	0.52	0.015	76
4	0.06	0.00	0.06	0.16	0.14	0.008	18
5	0.03	0.00	0.03	0.06	0.62	0.038	76
6	0.03	0.00	0.03	0.03	0.46	0.018	58
7	0.02	0.00	0.02	0.04	0.33	0.009	39
8	0.02	0.00	0.02	0.04	0.05	0.003	5

Composite Results

BSHC	=	0.35 g/hp-hr	=	0.47 g/kW-hr
BSCO	=	0.61 g/hp-hr	=	0.82 g/kW-hr
BSNOx	=	3.90 g/hp-hr	=	5.23 g/kW-hr
Particulate	=	0.159 g/hp-hr	=	0.213 g/kW-hr
BSCO2	=	519 g/hp-hr	=	696 g/kW-hr
BSFC	=	0.361 lb/hp-hr	=	0.220 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.35 g/hp-hr	=	0.47 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 8.1L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 BASELINE FUEL 20X20

Test No.: 68-4970-1-CORR
 Date: 11/25/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 RUN 63

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.7 (29.14)	98.7 (29.14)	98.6 (29.13)	98.6 (29.13)
Dil. Air: Temp, °C (°F) / AH, g/kg	24.4 (76.0) / 4.5	25.0 (77.0) / 4.3	25.0 (77.0) / 4.3	25.0 (77.0) / 4.3
Engine Air Dew Pt., °C (°F)	10.6 (51.0)	10.6 (51.0)	11.1 (52.0)	10.9 (51.6)
Engine Air Temp, °C (°F)	21.6 (70.9)	22.2 (72.0)	22.2 (72.0)	22.2 (72.0)
Engine Air: RH,% / AH, g/kg	49 / 8.2	48 / 8.2	49 / 8.5	49 / 8.4
NOx Humidity C.F.	.956	.956	.961	.959
Dry-to-Wet C.F.	.981	.984	.987	.991
Time, seconds	899.5	899.8	900.1	600.1
Tot. Blower Rate, scmm (scfm)*	59.75 (2,264.2)	59.85 (2,268.1)	59.70 (2,262.3)	59.86 (2,268.2)
90mm Sample Rate, scmm (scfm)*	0.0518 (1.96)	0.0549 (2.08)	0.0572 (2.17)	0.0584 (2.21)
Total Volume, scm (scf)*	896.6 (33,974)	898.4 (34,045)	896.5 (33,970)	599.3 (22,708)
HC Sample Meter/Range/ppm	0.0/0/23.5	0.0/0/21.6	0.0/0/21.3	0.0/0/30.1
HC Bckgrd Meter/Range/ppm	4.7/100/4.8	4.6/100/4.7	4.4/100/4.5	4.5/100/4.6
CO Sample Meter/Range/ppm (Dry)	12.1/100/11.5	10.9/100/10.4	20.0/100/19.2	36.5/100/35.4
CO Bckgrd Meter/Range/ppm	0.7/100/0.7	0.6/100/0.6	1.1/100/1.0	2.4/100/2.3
CO2 Sample Meter/Range/% (Wet)	66.3/2/1.2604	53.2/2/0.9788	78.6/1/0.7020	40.8/1/0.2823
CO2 Bckgrd Meter/Range/%	3.0/2/0.0493	3.2/2/0.0526	8.5/1/0.0500	9.0/1/0.0530
NOx Sample Meter/Range/ppm (Dry)	0.0/0/93.0	0.0/0/64.9	0.0/0/45.4	0.0/0/18.4
NOx Bckgrd Meter/Range/ppm	0.6/25/0.2	0.8/25/0.2	0.7/25/0.2	0.8/25/0.2
CH4 Sample Meter/Range/ppm	2.6	2.5	2.5	2.6
CH4 Bckgrd Meter/Range/ppm	2.9	2.7	2.6	2.5
Dilution Factor	10.71	13.78	19.17	46.86
HC Concentration, ppm	19.21	17.31	17.06	25.64
CO Concentration, ppm	10.55	9.58	17.83	32.80
CO2 Concentration, %	1.22	0.93	0.65	0.23
NOx Concentration, ppm	91.12	63.65	44.65	17.99
HC Mass, grams	10.68	9.64	9.45	9.50
CO Mass, grams	11.82	10.75	19.97	24.56
CO2 Mass, grams	21,398.54	16,404.15	11,521.10	2,711.06
NOx Mass, grams	160.25	112.17	78.94	21.22
Part. Mass, grams	6.784	3.277	2.183	1.113
Fuel, kg (lb)	6.745 (14.87)	5.173 (11.41)	3.642 (8.03)	0.874 (1.93)
KW-HR (hp-hr)	31.86 (42.72)	24.00 (32.18)	16.05 (21.53)	2.10 (2.82)
Filter Number	7064	7065	7066	7067
Weight Gain, mg	5.876	3.001	2.090	1.086
Sample Multiplier	1.154	1.092	1.045	1.025
Blower 1, scf	33,944.3	34,013.5	33,937.7	22,686.1
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.340	31.272	31.277	20.836
Gas Meter 2, scf	60.768	62.449	63.794	42.984

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 8.1L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 BASELINE FUEL 20X20

Test No.: 68-4970-1-CORR
 Date: 11/25/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 RUN 63

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.6 (29.12)	98.6 (29.12)	98.6 (29.11)	98.6 (29.11)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 4.3	25.6 (78.0) / 4.6	25.0 (77.0) / 5.5	25.0 (77.0) / 5.5
Engine Air Dew Pt., °C (°F)	11.1 (52.0)	11.2 (52.1)	11.3 (52.4)	11.7 (53.1)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.8 (73.0)	23.3 (74.0)	24.4 (76.0)
Engine Air: RH, % / AH, g/kg	49 / 8.5	48 / 8.5	47 / 8.6	45 / 8.8
NOx Humidity C.F.	.961	.962	.963	.967
Dry-to-Wet C.F.	.984	.985	.986	.990
Time, seconds	599.7	599.7	599.8	900.1
Tot. Blower Rate, scmm (scfm)*	59.69 (2,261.7)	59.65 (2,260.3)	59.77 (2,265.0)	60.10 (2,277.4)
90mm Sample Rate, scmm (scfm)*	0.0535 (2.03)	0.0556 (2.11)	0.0575 (2.18)	0.0574 (2.17)
Total Volume, scm (scf)*	597.1 (22,626)	596.7 (22,613)	598.1 (22,664)	902.5 (34,197)
HC Sample Meter/Range/ppm	0.0/0/14.9	0.0/0/14.6	0.0/0/13.1	0.0/0/9.4
HC Bckgrd Meter/Range/ppm	4.2/100/4.3	4.3/100/4.4	4.3/100/4.4	4.1/100/4.2
CO Sample Meter/Range/ppm (Dry)	15.4/100/14.7	7.4/100/7.0	9.7/100/9.2	6.4/100/6.1
CO Bckgrd Meter/Range/ppm	1.6/100/1.5	1.1/100/1.0	0.9/100/0.8	1.1/100/1.0
CO2 Sample Meter/Range/% (Wet)	55.7/2/1.0312	85.2/1/0.7997	66.8/1/0.5475	15.0/1/0.0907
CO2 Bckgrd Meter/Range/%	3.0/2/0.0493	8.3/1/0.0488	8.3/1/0.0488	8.5/1/0.0500
NOx Sample Meter/Range/ppm (Dry)	0.0/0/81.5	0.0/0/60.6	0.0/0/43.1	0.0/0/4.2
NOx Bckgrd Meter/Range/ppm	0.6/25/0.2	0.5/25/0.1	0.5/25/0.1	0.5/25/0.1
CH4 Sample Meter/Range/ppm	2.2	2.2	2.3	2.3
CH4 Bckgrd Meter/Range/ppm	2.4	2.4	2.4	2.2
Dilution Factor	13.09	16.88	24.62	146.73
HC Concentration, ppm	10.94	10.49	8.97	5.24
CO Concentration, ppm	12.94	5.88	8.22	4.97
CO2 Concentration, %	0.99	0.75	0.50	0.04
NOx Concentration, ppm	79.99	59.54	42.38	4.02
HC Mass, grams	4.04	3.88	3.33	2.93
CO Mass, grams	9.66	4.38	6.15	5.61
CO2 Mass, grams	11,554.66	8,831.27	5,879.07	727.15
NOx Mass, grams	94.20	70.12	50.11	7.20
Part. Mass, grams	5.573	2.654	1.367	0.507
Fuel, kg (lb)	3.642 (8.03)	2.783 (6.14)	1.855 (4.09)	0.234 (0.52)
KW-HR (hp-hr)	17.54 (23.52)	13.21 (17.71)	8.81 (11.81)	0.05 (0.07)
Filter Number	7068	7069	7070	7071
Weight Gain, mg	4.994	2.471	1.313	0.483
Sample Multiplier	1.116	1.074	1.041	1.049
Blower 1, scf	22,606.0	22,592.0	22,642.0	34,164.8
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	20.829	20.816	20.746	31.209
Gas Meter 2, scf	41.105	41.868	42.515	63.813

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 BASELINE FUEL 20X20

Test No.: 68-4970-2-CORR
 Date: 12/01/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 RUN 67

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Temp °F	Intake Air		Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft			Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	446.0	900	2,000	446.0	60.8	72.0	10.8	29.44	1.001	0.999	0.973	0.994
2	2,000	75.0	334.5	900	2,000	338.0	46.7	73.0	11.2	29.45	1.009	0.993	0.975	0.997
3	2,000	50.0	223.0	900	2,000	225.0	33.5	72.0	11.3	29.46	1.012	0.992	0.978	0.994
4	2,000	10.0	44.6	600	2,001	44.0	12.3	72.1	11.4	29.47	1.012	0.991	0.982	0.994
5	1,400	100.0	529.0	600	1,400	529.0	49.5	73.0	11.2	29.48	1.009	0.993	0.974	0.996
6	1,400	75.0	396.8	600	1,400	402.0	37.0	75.0	11.1	29.48	1.007	0.995	0.976	1.002
7	1,400	50.0	264.5	600	1,401	266.0	24.6	74.0	11.2	29.48	1.009	0.993	0.979	0.999
8	800	0.0	0.0	900	810	1.0	2.2	75.1	11.1	29.48	1.007	0.995	0.983	1.002

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	169.8	44.41	0.00	44.41	49.1	653.7	27.69	87,528
2	128.4	39.32	0.00	39.32	43.5	459.3	13.50	67,094
3	85.6	37.99	0.07	37.92	81.7	323.1	9.40	48,031
4	16.8	57.56	0.23	57.33	148.8	133.5	6.90	17,324
5	140.8	24.66	0.00	24.66	59.4	581.2	33.84	71,230
6	106.9	23.76	0.00	23.76	24.9	429.2	15.43	53,210
7	70.7	20.02	0.02	20.00	38.3	301.1	8.63	35,314
8	0.2	10.41	0.00	10.41	23.7	29.1	2.19	3,081

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	25.5	6.66	0.00	6.66	7.37	98.05	4.15	13,129
2	.150	19.3	5.90	0.00	5.90	6.53	68.90	2.02	10,064
3	.150	12.8	5.70	0.01	5.69	12.25	48.47	1.41	7,205
4	.100	1.7	5.76	0.02	5.73	14.88	13.35	0.69	1,732
5	.100	14.1	2.47	0.00	2.47	5.94	58.12	3.38	7,123
6	.100	10.7	2.38	0.00	2.38	2.49	42.92	1.54	5,321
7	.100	7.1	2.00	0.00	2.00	3.83	30.11	0.86	3,531
8	.150	0.0	1.56	0.00	1.56	3.55	4.37	0.33	462
Total		91.1	32.42	0.03	32.38	56.85	364.29	14.40	48,568

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 BASELINE FUEL 20X20

Test No.: 68-4970-2-CORR
 Date: 12/01/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 RUN 67

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.07	0.00	0.07	0.08	1.08	0.046	144
2	0.06	0.00	0.06	0.07	0.76	0.022	110
3	0.06	0.00	0.06	0.13	0.53	0.015	79
4	0.06	0.00	0.06	0.16	0.15	0.008	19
5	0.03	0.00	0.03	0.07	0.64	0.037	78
6	0.03	0.00	0.03	0.03	0.47	0.017	58
7	0.02	0.00	0.02	0.04	0.33	0.009	39
8	0.02	0.00	0.02	0.04	0.05	0.004	5

Composite Results

BSHC	=	0.36 g/hp-hr	=	0.48 g/kW-hr
BSCO	=	0.62 g/hp-hr	=	0.84 g/kW-hr
BSNOx	=	4.00 g/hp-hr	=	5.36 g/kW-hr
Particulate	=	0.158 g/hp-hr	=	0.212 g/kW-hr
BSCO2	=	533 g/hp-hr	=	715 g/kW-hr
BSFC	=	0.371 lb/hp-hr	=	0.226 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.36 g/hp-hr	=	0.48 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L	Test No.: 68-4970-2-CORR	DIESEL 2D, EM-4970-F
Engine Desc.: 6.8 L (415 CID) IL6	Date: 12/01/2003 Time:	HCR: 1.826 FID Resp: 1.00
Engine Cycle: Diesel	Program SSDIL: 2.32-R	H= 0.133 C= 0.868 O= 0.000 X= 0.000
Engine S/N: 6068EXP000098	Cell: 16 Bag Cart: 1	
BASELINE FUEL 20X20	RUN 67	

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.7 (29.44)	99.7 (29.45)	99.8 (29.46)	99.8 (29.47)
Dil. Air: Temp, °C (°F) / AH, g/kg	23.9 (75.0) / 9.7	24.4 (76.0) / 10.1	24.4 (76.0) / 10.1	25.0 (77.0) / 9.9
Engine Air Dew Pt., °C (°F)	14.9 (58.8)	15.5 (59.9)	15.7 (60.2)	15.7 (60.3)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.8 (73.0)	22.2 (72.0)	22.3 (72.1)
Engine Air: RH,% / AH, g/kg	63 / 10.8	64 / 11.2	66 / 11.3	66 / 11.4
NOx Humidity C.F.	1.001	1.009	1.012	1.012
Dry-to-Wet C.F.	.973	.975	.978	.982
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	62.28 (2,360.1)	61.44 (2,328.1)	62.26 (2,359.1)	62.40 (2,364.7)
90mm Sample Rate, scmm (scfm)*	0.0522 (1.98)	0.0556 (2.11)	0.0575 (2.18)	0.0581 (2.20)
Total Volume, scm (scf)*	935.0 (35,432)	922.4 (34,954)	934.7 (35,420)	624.6 (23,669)
HC Sample Meter/Range/ppm	0.0/0/23.5	0.0/0/21.9	0.0/0/20.9	0.0/0/29.2
HC Bckgrd Meter/Range/ppm	4.7/100/4.8	4.9/100/5.0	4.6/100/4.7	4.4/100/4.5
CO Sample Meter/Range/ppm (Dry)	11.7/100/11.1	10.5/100/10.0	19.0/100/18.2	33.7/100/32.7
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.2/100/0.2	0.2/100/0.2	0.2/100/0.2
CO2 Sample Meter/Range/% (Wet)	65.1/2/1.2338	52.8/2/0.9705	78.5/1/0.7006	40.9/1/0.2832
CO2 Bckgrd Meter/Range/%	2.8/2/0.0460	2.9/2/0.0477	8.3/1/0.0488	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/87.5	0.0/0/61.8	0.0/0/42.8	0.0/0/17.6
NOx Bckgrd Meter/Range/ppm	0.7/25/0.2	0.6/25/0.2	0.7/25/0.2	0.6/25/0.2
CH4 Sample Meter/Range/ppm	1.8	1.9	2.0	2.1
CH4 Bckgrd Meter/Range/ppm	2.1	2.1	2.1	2.1
Dilution Factor	10.94	13.90	19.21	46.78
HC Concentration, ppm	19.13	17.25	16.44	24.85
CO Concentration, ppm	10.51	9.44	17.48	31.78
CO2 Concentration, %	1.19	0.93	0.65	0.24
NOx Concentration, ppm	85.05	60.09	41.63	17.14
HC Mass, grams	11.10	9.83	9.50	9.59
CO Mass, grams	12.28	10.88	20.42	24.80
CO2 Mass, grams	21,881.97	16,773.54	12,007.69	2,887.26
NOx Mass, grams	163.42	114.83	80.79	22.25
Part. Mass, grams	6.930	3.397	2.369	1.160
Fuel, kg (lb)	6.898 (15.21)	5.290 (11.66)	3.795 (8.37)	0.930 (2.05)
KW-HR (hp-hr)	31.65 (42.44)	23.94 (32.11)	15.96 (21.40)	2.09 (2.80)
Filter Number	7115	7116	7117	7118
Weight Gain, mg	5.805	3.071	2.184	1.080
Sample Multiplier	1.194	1.106	1.085	1.074
Blower 1, scf	35,402.2	34,922.0	35,386.8	23,647.3
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.625	31.667	31.684	21.103
Gas Meter 2, scf	61.304	63.264	64.339	43.135

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 BASELINE FUEL 20X20

Test No.: 68-4970-2-CORR
 Date: 12/01/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 RUN 67

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.8 (29.48)	99.8 (29.48)	99.8 (29.48)	99.8 (29.48)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.6 (78.0) / 10.3	26.7 (80.0) / 10.6	25.6 (78.0) / 10.3	26.1 (79.0) / 10.1
Engine Air Dew Pt., °C (°F)	15.5 (59.9)	15.3 (59.6)	15.5 (59.9)	15.3 (59.6)
Engine Air Temp, °C (°F)	22.8 (73.0)	23.9 (75.0)	23.3 (74.0)	23.9 (75.1)
Engine Air: RH,% / AH, g/kg	64 / 11.2	59 / 11.1	61 / 11.2	59 / 11.1
NOx Humidity C.F.	1.009	1.007	1.009	1.007
Dry-to-Wet C.F.	.974	.976	.979	.983
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	62.29 (2,360.3)	62.20 (2,357.1)	62.12 (2,354.0)	62.97 (2,386.0)
90mm Sample Rate, scmm (scfm)*	0.0540 (2.05)	0.0569 (2.16)	0.0582 (2.20)	0.0584 (2.21)
Total Volume, scm (scf)*	623.4 (23,623)	622.6 (23,592)	621.8 (23,562)	945.4 (35,823)
HC Sample Meter/Range/ppm	0.0/0/15.0	0.0/0/14.3	0.0/0/12.0	0.0/0/8.5
HC Bckgrd Meter/Range/ppm	4.6/100/4.7	4.2/100/4.3	3.4/100/3.5	4.1/100/4.2
CO Sample Meter/Range/ppm (Dry)	14.1/100/13.5	6.2/100/5.9	9.0/100/8.5	5.7/100/5.4
CO Bckgrd Meter/Range/ppm	0.3/100/0.3	0.4/100/0.4	0.1/100/0.1	0.3/100/0.3
CO2 Sample Meter/Range/% (Wet)	55.1/2/1.0186	83.2/1/0.7692	64.9/1/0.5249	14.5/1/0.0875
CO2 Bckgrd Meter/Range/%	3.2/2/0.0526	7.9/1/0.0463	7.6/1/0.0445	7.9/1/0.0463
NOx Sample Meter/Range/ppm (Dry)	0.0/0/77.2	0.0/0/57.1	0.0/0/39.9	0.0/0/3.9
NOx Bckgrd Meter/Range/ppm	0.6/25/0.2	0.5/25/0.1	0.4/25/0.1	0.4/25/0.1
CH4 Sample Meter/Range/ppm	1.9	1.8	1.9	2.0
CH4 Bckgrd Meter/Range/ppm	2.1	2.0	2.0	2.1
Dilution Factor	13.25	17.55	25.68	152.28
HC Concentration, ppm	10.64	10.27	8.68	4.33
CO Concentration, ppm	12.72	5.34	8.22	5.02
CO2 Concentration, %	0.97	0.73	0.48	0.04
NOx Concentration, ppm	75.03	55.60	38.97	3.73
HC Mass, grams	4.11	3.96	3.34	2.60
CO Mass, grams	9.91	4.15	6.39	5.92
CO2 Mass, grams	11,871.70	8,868.40	5,885.73	770.32
NOx Mass, grams	96.87	71.53	50.19	7.28
Part. Mass, grams	5.678	2.585	1.448	0.550
Fuel, kg (lb)	3.742 (8.25)	2.795 (6.16)	1.857 (4.10)	0.248 (0.55)
KW-HR (hp-hr)	17.50 (23.47)	13.29 (17.82)	8.79 (11.79)	0.03 (0.04)
Filter Number	7119	7120	7121	7122
Weight Gain, mg	4.918	2.364	1.354	0.510
Sample Multiplier	1.154	1.094	1.069	1.079
Blower 1, scf	23,602.9	23,570.8	23,540.4	35,790.2
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	21.037	20.992	21.078	31.591
Gas Meter 2, scf	41.500	42.565	43.114	64.785

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-1-CORR
 Date: 12/04/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 82

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	414.0	900	2,000	414.0	56.6	73.0	9.9	29.27	0.986	1.010	0.979	1.000
2	2,000	75.0	310.5	900	2,000	311.0	43.9	73.3	10.3	29.27	0.993	1.005	0.982	1.001
3	2,000	50.0	207.0	900	2,001	209.0	30.9	74.1	10.3	29.28	0.993	1.005	0.985	1.003
4	2,000	10.0	41.4	600	2,001	41.0	11.5	73.0	10.5	29.29	0.995	1.003	0.989	1.000
5	1,400	100.0	501.0	600	1,400	501.0	46.0	74.0	10.3	29.28	0.993	1.005	0.982	1.003
6	1,400	75.0	375.8	600	1,400	377.0	34.6	75.0	10.5	29.29	0.996	1.003	0.983	1.006
7	1,400	50.0	250.5	600	1,400	251.0	23.4	77.0	10.6	29.28	0.998	1.001	0.984	1.012
8	800	0.0	0.0	900	802	0.0	2.1	78.0	10.8	29.28	1.001	0.999	0.984	1.015

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	157.5	32.58	0.00	32.58	46.6	537.7	25.08	78,794
2	118.1	34.51	0.00	34.51	46.8	386.9	12.22	61,062
3	79.7	36.87	0.80	36.08	90.9	271.0	8.74	42,864
4	15.5	50.31	0.40	49.91	125.1	119.4	5.57	15,716
5	133.3	25.53	0.00	25.53	53.8	494.1	31.49	64,025
6	100.3	21.79	0.00	21.79	24.3	365.4	13.75	48,103
7	66.8	20.31	0.00	20.31	37.4	260.5	7.06	32,498
8	0.3	8.97	0.12	8.85	17.4	25.7	1.76	2,831

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
5	.100	13.3	2.55	0.00	2.55	5.38	49.41	3.15	6,403
6	.100	10.0	2.18	0.00	2.18	2.43	36.54	1.38	4,810
7	.100	6.7	2.03	0.00	2.03	3.74	26.05	0.71	3,250
8	.150	0.0	1.35	0.02	1.33	2.60	3.85	0.26	425
1	.150	23.6	4.89	0.00	4.89	6.98	80.65	3.76	11,819
2	.150	17.7	5.18	0.00	5.18	7.01	58.03	1.83	9,159
3	.150	12.0	5.53	0.12	5.41	13.64	40.65	1.31	6,430
4	.100	1.6	5.03	0.04	4.99	12.51	11.94	0.56	1,572
Total		84.9	28.74	0.18	28.56	54.30	307.12	12.96	43,867

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-1-CORR
 Date: 12/04/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 82

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.06	0.00	0.06	0.08	0.95	0.044	139
2	0.06	0.00	0.06	0.08	0.68	0.022	108
3	0.07	0.00	0.06	0.16	0.48	0.015	76
4	0.06	0.00	0.06	0.15	0.14	0.007	19
5	0.03	0.00	0.03	0.06	0.58	0.037	75
6	0.03	0.00	0.03	0.03	0.43	0.016	57
7	0.02	0.00	0.02	0.04	0.31	0.008	38
8	0.02	0.00	0.02	0.03	0.05	0.003	5

Composite Results

BSHC	=	0.34 g/hp-hr	=	0.45 g/kW-hr
BSCO	=	0.64 g/hp-hr	=	0.86 g/kW-hr
BSNOx	=	3.62 g/hp-hr	=	4.85 g/kW-hr
Particulate	=	0.153 g/hp-hr	=	0.205 g/kW-hr
BSCO2	=	517 g/hp-hr	=	693 g/kW-hr
BSFC	=	0.372 lb/hp-hr	=	0.226 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.34 g/hp-hr	=	0.45 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-1-CORR
 Date: 12/04/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 82

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.1 (29.27)	99.1 (29.27)	99.1 (29.28)	99.2 (29.29)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.1 (79.0) / 6.2	27.2 (81.0) / 5.7	27.8 (82.0) / 5.4	27.8 (82.0) / 5.4
Engine Air Dew Pt., °C (°F)	13.6 (56.4)	14.1 (57.4)	14.1 (57.4)	14.3 (57.8)
Engine Air Temp, °C (°F)	22.8 (73.0)	22.9 (73.3)	23.4 (74.1)	22.8 (73.0)
Engine Air: RH,% / AH, g/kg	56 / 9.9	57 / 10.3	56 / 10.3	59 / 10.5
NOx Humidity C.F.	.986	.993	.993	.995
Dry-to-Wet C.F.	.979	.982	.985	.989
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	59.98 (2,273.0)	59.89 (2,269.4)	60.63 (2,297.4)	60.40 (2,288.8)
90mm Sample Rate, scmm (scfm)*	0.0521 (1.97)	0.0551 (2.09)	0.0572 (2.17)	0.0574 (2.18)
Total Volume, scm (scf)*	900.5 (34,124)	899.1 (34,072)	910.3 (34,494)	604.6 (22,910)
HC Sample Meter/Range/ppm	0.0/0/18.3	0.0/0/19.4	0.0/0/20.7	0.0/0/27.1
HC Bckgrd Meter/Range/ppm	4.0/100/4.1	4.1/100/4.2	4.6/100/4.7	4.8/100/4.9
CO Sample Meter/Range/ppm (Dry)	11.6/100/11.0	11.6/100/11.0	21.6/100/20.8	29.5/100/28.5
CO Bckgrd Meter/Range/ppm	0.4/100/0.4	0.4/100/0.4	0.4/100/0.4	0.6/100/0.6
CO2 Sample Meter/Range/% (Wet)	61.9/2/1.1638	92.1/1/0.9114	74.5/1/0.6455	39.1/1/0.2679
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	8.5/1/0.0500	8.2/1/0.0482	8.2/1/0.0482
NOx Sample Meter/Range/ppm (Dry)	0.0/0/75.4	0.0/0/53.9	0.0/0/37.3	0.0/0/16.4
NOx Bckgrd Meter/Range/ppm	0.5/25/0.1	0.8/25/0.2	0.8/25/0.2	0.6/25/0.2
CH4 Sample Meter/Range/ppm	2.1	2.1	2.4	2.3
CH4 Bckgrd Meter/Range/ppm	2.3	2.2	2.2	2.2
Dilution Factor	11.60	14.80	20.83	49.50
HC Concentration, ppm	14.55	15.49	16.30	22.37
CO Concentration, ppm	10.35	10.41	19.99	27.61
CO2 Concentration, %	1.11	0.86	0.60	0.22
NOx Concentration, ppm	73.75	52.80	36.53	16.11
HC Mass, grams	8.14	8.63	9.22	8.38
CO Mass, grams	11.64	11.69	22.73	20.85
CO2 Mass, grams	19,698.57	15,265.62	10,715.88	2,619.32
NOx Mass, grams	134.41	96.72	67.75	19.90
Part. Mass, grams	6.205	3.040	2.173	0.924
Fuel, kg (lb)	6.423 (14.16)	4.981 (10.98)	3.507 (7.73)	0.871 (1.92)
KW-HR (hp-hr)	29.36 (39.37)	22.02 (29.53)	14.85 (19.92)	1.93 (2.59)
Filter Number	7214	7334	7335	7336
Weight Gain, mg	5.384	2.794	2.050	0.878
Sample Multiplier	1.153	1.088	1.060	1.053
Blower 1, scf	34,094.8	34,040.6	34,461.4	22,888.2
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.310	31.250	31.241	20.842
Gas Meter 2, scf	60.918	62.567	63.781	42.603

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-1-CORR
 Date: 12/04/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 82

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.1 (29.28)	99.2 (29.29)	99.1 (29.28)	99.1 (29.28)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.8 (82.0) / 5.4	28.3 (83.0) / 6.5	28.3 (83.0) / 7.1	27.8 (82.0) / 9.5
Engine Air Dew Pt., °C (°F)	14.1 (57.4)	14.4 (57.9)	14.6 (58.2)	14.8 (58.6)
Engine Air Temp, °C (°F)	23.3 (74.0)	23.9 (75.0)	25.0 (77.0)	25.6 (78.0)
Engine Air: RH,% / AH, g/kg	56 / 10.3	55 / 10.5	52 / 10.6	51 / 10.8
NOx Humidity C.F.	.993	.996	.998	1.001
Dry-to-Wet C.F.	.982	.983	.984	.984
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	60.28 (2,284.2)	60.29 (2,284.4)	60.15 (2,279.3)	60.62 (2,297.2)
90mm Sample Rate, scmm (scfm)*	0.0534 (2.02)	0.0562 (2.13)	0.0570 (2.16)	0.0575 (2.18)
Total Volume, scm (scf)*	603.3 (22,862)	603.4 (22,866)	602.1 (22,814)	910.2 (34,490)
HC Sample Meter/Range/ppm	0.0/0/15.8	0.0/0/14.8	0.0/0/14.0	0.0/0/8.9
HC Bckgrd Meter/Range/ppm	5.0/100/5.1	5.4/100/5.5	5.1/100/5.2	4.9/100/5.0
CO Sample Meter/Range/ppm (Dry)	13.1/100/12.5	6.0/100/5.7	9.0/100/8.5	4.5/100/4.2
CO Bckgrd Meter/Range/ppm	0.3/100/0.3	0.2/100/0.2	0.1/100/0.1	0.4/100/0.4
CO2 Sample Meter/Range/% (Wet)	94.1/1/0.9457	80.1/1/0.7235	63.0/1/0.5028	14.4/1/0.0868
CO2 Bckgrd Meter/Range/%	8.2/1/0.0482	8.4/1/0.0494	7.9/1/0.0463	8.1/1/0.0475
NOx Sample Meter/Range/ppm (Dry)	0.0/0/68.4	0.0/0/50.4	0.0/0/35.9	0.0/0/3.6
NOx Bckgrd Meter/Range/ppm	0.7/25/0.2	0.7/25/0.2	0.5/25/0.1	0.5/25/0.1
CH4 Sample Meter/Range/ppm	2.0	2.0	2.1	2.2
CH4 Bckgrd Meter/Range/ppm	2.5	2.2	2.2	2.2
Dilution Factor	14.27	18.65	26.80	153.61
HC Concentration, ppm	11.08	9.62	9.06	3.97
CO Concentration, ppm	11.90	5.36	8.28	3.82
CO2 Concentration, %	0.90	0.68	0.46	0.04
NOx Concentration, ppm	67.00	49.37	35.20	3.44
HC Mass, grams	4.26	3.63	3.39	2.24
CO Mass, grams	8.97	4.04	6.23	4.34
CO2 Mass, grams	10,670.89	8,017.23	5,416.29	707.79
NOx Mass, grams	82.35	60.90	43.41	6.42
Part. Mass, grams	5.220	2.285	1.176	0.441
Fuel, kg (lb)	3.480 (7.67)	2.614 (5.76)	1.769 (3.90)	0.235 (0.52)
KW-HR (hp-hr)	16.57 (22.22)	12.46 (16.71)	8.30 (11.13)	0.06 (0.08)
Filter Number	7337	7338	7339	7340
Weight Gain, mg	4.622	2.128	1.114	0.418
Sample Multiplier	1.129	1.074	1.056	1.054
Blower 1, scf	22,842.1	22,844.4	22,792.7	34,457.3
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	20.847	20.838	20.840	31.278
Gas Meter 2, scf	41.092	42.130	42.455	63.989

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-2-CORR
 Date: 12/05/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 90

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	414.0	900	1,999	414.0	56.8	71.0	10.0	29.49	0.987	1.010	0.980	0.989
2	2,000	75.0	310.5	900	2,000	314.0	44.4	73.3	10.2	29.50	0.990	1.007	0.983	0.996
3	2,000	50.0	207.0	900	2,000	210.0	31.0	74.0	10.4	29.51	0.994	1.005	0.985	0.998
4	2,000	10.0	41.4	600	2,001	43.0	12.0	74.0	10.4	29.52	0.994	1.005	0.989	0.997
5	1,400	100.0	501.0	600	1,400	501.0	46.2	74.0	10.2	29.52	0.991	1.007	0.984	0.997
6	1,400	75.0	375.8	600	1,400	377.0	34.6	75.0	10.2	29.53	0.991	1.007	0.986	1.000
7	1,400	50.0	250.5	600	1,401	253.0	23.5	74.0	10.2	29.53	0.991	1.007	0.989	0.997
8	803	0.0	0.0	900	803	1.0	2.1	77.4	10.4	29.52	0.995	1.004	0.990	1.007

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	157.4	32.64	0.00	32.64	49.0	526.5	25.46	79,032
2	119.4	32.84	0.04	32.80	48.1	387.3	12.82	61,706
3	79.9	36.48	0.00	36.48	86.4	272.3	8.79	42,993
4	16.4	50.38	0.11	50.27	128.0	124.5	5.80	16,412
5	133.3	24.57	0.00	24.57	50.4	496.3	29.47	64,309
6	100.3	23.47	0.00	23.47	24.9	362.4	14.09	48,146
7	67.3	20.59	0.00	20.59	35.8	259.3	7.05	32,646
8	0.2	10.07	0.00	10.07	17.7	24.0	1.72	2,909

Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	23.6	4.90	0.00	4.90	7.35	78.98	3.82	11,855
2	.150	17.9	4.93	0.01	4.92	7.21	58.09	1.92	9,256
3	.150	12.0	5.47	0.00	5.47	12.97	40.84	1.32	6,449
4	.100	1.6	5.04	0.01	5.03	12.80	12.45	0.58	1,641
5	.100	13.3	2.46	0.00	2.46	5.04	49.63	2.95	6,431
6	.100	10.0	2.35	0.00	2.35	2.49	36.24	1.41	4,815
7	.100	6.7	2.06	0.00	2.06	3.58	25.93	0.70	3,265
8	.150	0.0	1.51	0.00	1.51	2.65	3.60	0.26	436
Total		85.2	28.71	0.02	28.69	54.09	305.76	12.96	44,147

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-2-CORR
 Date: 12/05/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 90

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.06	0.00	0.06	0.09	0.93	0.045	139
2	0.06	0.00	0.06	0.08	0.68	0.023	109
3	0.06	0.00	0.06	0.15	0.48	0.015	76
4	0.06	0.00	0.06	0.15	0.15	0.007	19
5	0.03	0.00	0.03	0.06	0.58	0.035	75
6	0.03	0.00	0.03	0.03	0.43	0.017	56
7	0.02	0.00	0.02	0.04	0.30	0.008	38
8	0.02	0.00	0.02	0.03	0.04	0.003	5

Composite Results

BSHC	=	0.34 g/hp-hr	=	0.45 g/kW-hr
BSCO	=	0.63 g/hp-hr	=	0.85 g/kW-hr
BSNOx	=	3.59 g/hp-hr	=	4.81 g/kW-hr
Particulate	=	0.152 g/hp-hr	=	0.204 g/kW-hr
BSCO2	=	518 g/hp-hr	=	695 g/kW-hr
BSFC	=	0.373 lb/hp-hr	=	0.227 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.34 g/hp-hr	=	0.45 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-2-CORR
 Date: 12/05/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 90

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.9 (29.49)	99.9 (29.50)	99.9 (29.51)	100.0 (29.52)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 5.9	25.0 (77.0) / 5.3	25.0 (77.0) / 5.3	25.0 (77.0) / 5.3
Engine Air Dew Pt., °C (°F)	13.7 (56.7)	14.0 (57.2)	14.3 (57.8)	14.3 (57.8)
Engine Air Temp, °C (°F)	21.7 (71.0)	22.9 (73.3)	23.3 (74.0)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	61 / 10.0	57 / 10.2	57 / 10.4	57 / 10.4
NOx Humidity C.F.	.987	.990	.994	.994
Dry-to-Wet C.F.	.980	.983	.985	.989
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	60.64 (2,297.9)	60.67 (2,298.9)	60.69 (2,299.6)	60.87 (2,306.6)
90mm Sample Rate, scmm (scfm)*	0.0528 (2.00)	0.0553 (2.10)	0.0570 (2.16)	0.0574 (2.18)
Total Volume, scm (scf)*	910.4 (34,498)	910.9 (34,516)	911.2 (34,527)	609.3 (23,088)
HC Sample Meter/Range/ppm	0.0/0/18.1	0.0/0/18.3	0.0/0/20.0	0.0/0/26.3
HC Bckgrd Meter/Range/ppm	4.0/100/4.1	4.0/100/4.1	4.1/100/4.2	4.1/100/4.2
CO Sample Meter/Range/ppm (Dry)	11.7/100/11.1	11.6/100/11.0	20.3/100/19.5	29.5/100/28.5
CO Bckgrd Meter/Range/ppm	0.0/100/0.0	0.2/100/0.2	0.1/100/0.1	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	61.5/2/1.1551	91.8/1/0.9064	74.5/1/0.6455	39.9/1/0.2746
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	8.0/1/0.0469	8.0/1/0.0469	8.0/1/0.0469
NOx Sample Meter/Range/ppm (Dry)	0.0/0/73.0	0.0/0/53.3	0.0/0/37.3	0.0/0/16.9
NOx Bckgrd Meter/Range/ppm	0.4/25/0.1	0.1/25/0.0	0.5/25/0.1	0.2/25/0.1
CH4 Sample Meter/Range/ppm	2.0	2.1	2.4	2.5
CH4 Bckgrd Meter/Range/ppm	2.4	2.2	2.6	2.5
Dilution Factor	11.69	14.88	20.84	48.33
HC Concentration, ppm	14.35	14.55	16.06	22.25
CO Concentration, ppm	10.78	10.57	18.98	28.03
CO2 Concentration, %	1.11	0.86	0.60	0.23
NOx Concentration, ppm	71.40	52.32	36.63	16.69
HC Mass, grams	8.16	8.21	9.12	8.40
CO Mass, grams	12.26	12.02	21.61	21.33
CO2 Mass, grams	19,757.99	15,426.42	10,748.31	2,735.35
NOx Mass, grams	131.64	96.82	68.07	20.75
Part. Mass, grams	6.303	3.181	2.187	0.963
Fuel, kg (lb)	6.442 (14.21)	5.033 (11.10)	3.517 (7.75)	0.909 (2.00)
KW-HR (hp-hr)	29.34 (39.35)	22.25 (29.84)	14.90 (19.98)	2.04 (2.73)
Filter Number	7342	7401	7402	7403
Weight Gain, mg	5.486	2.898	2.054	0.908
Sample Multiplier	1.149	1.098	1.065	1.061
Blower 1, scf	34,467.8	34,484.2	34,494.7	23,066.4
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.656	31.674	31.725	21.155
Gas Meter 2, scf	61.683	63.120	64.146	42.923

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 7.7% ETHANOL 4930

Test No.: 68-4930-2-CORR
 Date: 12/05/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 7.7%EtOH, EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.030 X= 0.000
 RUN 90

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	100.0 (29.52)	100.0 (29.53)	100.0 (29.53)	100.0 (29.52)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 4.7	25.6 (78.0) / 4.5	25.6 (78.0) / 3.9	25.6 (78.0) / 5.7
Engine Air Dew Pt., °C (°F)	14.1 (57.4)	14.1 (57.4)	14.1 (57.4)	14.4 (57.9)
Engine Air Temp, °C (°F)	23.3 (74.0)	23.9 (75.0)	23.3 (74.0)	25.2 (77.4)
Engine Air: RH,% / AH, g/kg	56 / 10.2	54 / 10.2	56 / 10.2	51 / 10.4
NOx Humidity C.F.	.991	.991	.991	.995
Dry-to-Wet C.F.	.984	.986	.989	.990
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	60.78 (2,303.3)	60.72 (2,301.1)	60.88 (2,307.1)	61.55 (2,332.5)
90mm Sample Rate, scmm (scfm)*	0.0543 (2.06)	0.0566 (2.14)	0.0576 (2.18)	0.0582 (2.21)
Total Volume, scm (scf)*	608.4 (23,054)	607.8 (23,032)	609.4 (23,093)	924.2 (35,021)
HC Sample Meter/Range/ppm	0.0/0/14.3	0.0/0/13.7	0.0/0/12.5	0.0/0/7.6
HC Bckgrd Meter/Range/ppm	3.7/100/3.8	3.6/100/3.7	3.6/100/3.7	3.3/100/3.3
CO Sample Meter/Range/ppm (Dry)	12.0/100/11.4	6.1/100/5.8	8.5/100/8.1	4.2/100/4.0
CO Bckgrd Meter/Range/ppm	0.1/100/0.1	0.2/100/0.2	0.1/100/0.1	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	93.9/1/0.9422	79.6/1/0.7163	62.6/1/0.4982	14.0/1/0.0843
CO2 Bckgrd Meter/Range/%	8.2/1/0.0482	7.9/1/0.0463	7.7/1/0.0451	7.6/1/0.0445
NOx Sample Meter/Range/ppm (Dry)	0.0/0/68.0	0.0/0/49.6	0.0/0/35.3	0.0/0/3.3
NOx Bckgrd Meter/Range/ppm	0.4/25/0.1	0.3/25/0.1	0.2/25/0.1	0.3/25/0.1
CH4 Sample Meter/Range/ppm	2.0	1.8	1.9	2.0
CH4 Bckgrd Meter/Range/ppm	2.2	2.1	2.1	2.2
Dilution Factor	14.33	18.84	27.06	158.39
HC Concentration, ppm	10.79	10.20	8.94	4.26
CO Concentration, ppm	11.04	5.46	7.84	3.83
CO2 Concentration, %	0.90	0.67	0.45	0.04
NOx Concentration, ppm	66.84	48.86	34.87	3.18
HC Mass, grams	4.10	3.91	3.43	2.52
CO Mass, grams	8.39	4.15	5.97	4.42
CO2 Mass, grams	10,718.18	8,024.36	5,441.08	727.24
NOx Mass, grams	82.71	60.40	43.22	6.00
Part. Mass, grams	4.880	2.332	1.167	0.429
Fuel, kg (lb)	3.495 (7.71)	2.617 (5.77)	1.777 (3.92)	0.241 (0.53)
KW-HR (hp-hr)	16.56 (22.21)	12.46 (16.71)	8.37 (11.22)	0.04 (0.05)
Filter Number	7404	7405	7406	7407
Weight Gain, mg	4.352	2.170	1.104	0.406
Sample Multiplier	1.121	1.075	1.057	1.058
Blower 1, scf	23,033.0	23,010.6	23,071.3	34,987.6
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	21.140	21.169	21.161	31.662
Gas Meter 2, scf	41.698	42.599	43.003	64.770

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 10% ETHANOL 4937

Test No.: 68-4937-1-CORR
 Date: 12/08/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 10%EtOH, EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0.000
 RUN 95

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Temp °F	Intake Air		Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft			Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	407.0	900	2,000	407.0	56.4	72.7	10.1	29.03	0.990	1.008	0.975	1.005
2	2,000	75.0	305.3	900	1,999	307.0	44.2	73.0	10.1	29.03	0.990	1.008	0.976	1.006
3	2,000	50.0	203.5	900	2,000	205.0	31.1	73.0	10.2	29.03	0.990	1.007	0.979	1.006
4	2,000	10.0	40.7	600	2,001	43.0	12.1	73.0	10.4	29.04	0.994	1.004	0.982	1.006
5	1,400	100.0	491.0	600	1,400	491.0	48.2	74.1	10.5	29.04	0.997	1.002	0.976	1.009
6	1,400	75.0	368.3	600	1,400	369.0	34.8	76.0	10.7	29.03	1.000	1.000	0.978	1.015
7	1,400	50.0	245.5	600	1,401	248.0	23.4	75.0	10.9	29.03	1.003	0.998	0.980	1.012
8	800	0.0	0.0	900	803	1.0	2.2	77.4	10.9	29.03	1.004	0.997	0.984	1.019

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	155.0	29.38	0.00	29.38	45.9	517.8	24.51	77,691
2	116.6	31.74	0.00	31.74	47.9	377.0	12.02	60,882
3	78.0	34.50	0.33	34.18	92.3	268.7	8.23	42,743
4	16.4	52.80	0.84	51.96	143.7	122.0	5.82	16,322
5	130.7	23.56	0.36	23.19	48.2	473.3	25.76	66,430
6	98.3	21.97	0.15	21.82	23.8	351.9	13.04	47,999
7	66.0	19.58	0.14	19.44	38.5	254.1	6.92	32,243
8	0.1	8.92	0.12	8.80	17.6	24.7	1.74	2,975

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
5	.100	13.1	2.36	0.04	2.32	4.82	47.33	2.58	6,643
6	.100	9.8	2.20	0.02	2.18	2.38	35.19	1.30	4,800
7	.100	6.6	1.96	0.01	1.94	3.85	25.41	0.69	3,224
8	.150	0.0	1.34	0.02	1.32	2.63	3.71	0.26	446
1	.150	23.2	4.41	0.00	4.41	6.89	77.66	3.68	11,654
2	.150	17.5	4.76	0.00	4.76	7.19	56.55	1.80	9,132
3	.150	11.7	5.18	0.05	5.13	13.85	40.30	1.23	6,412
4	.100	1.6	5.28	0.08	5.20	14.37	12.20	0.58	1,632
Total		83.6	27.47	0.22	27.26	55.98	298.35	12.13	43,943

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 10% ETHANOL 4937

Test No.: 68-4937-1-CORR
 Date: 12/08/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 10%EtOH, EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0.000
 RUN 95

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.08	0.93	0.044	139
2	0.06	0.00	0.06	0.09	0.68	0.022	109
3	0.06	0.00	0.06	0.17	0.48	0.015	77
4	0.06	0.00	0.06	0.17	0.15	0.007	20
5	0.03	0.00	0.03	0.06	0.57	0.031	79
6	0.03	0.00	0.03	0.03	0.42	0.016	57
7	0.02	0.00	0.02	0.05	0.30	0.008	39
8	0.02	0.00	0.02	0.03	0.04	0.003	5

Composite Results

BSHC	=	0.33 g/hp-hr	=	0.44 g/kW-hr
BSCO	=	0.67 g/hp-hr	=	0.90 g/kW-hr
BSNOx	=	3.57 g/hp-hr	=	4.79 g/kW-hr
Particulate	=	0.145 g/hp-hr	=	0.195 g/kW-hr
BSCO2	=	526 g/hp-hr	=	705 g/kW-hr
BSFC	=	0.382 lb/hp-hr	=	0.233 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.33 g/hp-hr	=	0.44 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 10% ETHANOL 4937

Test No.: 68-4937-1-CORR
 Date: 12/08/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 10%EtOH, EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0.000
 RUN 95

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.3 (29.03)	98.3 (29.03)	98.3 (29.03)	98.3 (29.04)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.1 (79.0) / 8.9	26.7 (80.0) / 9.3	27.8 (82.0) / 9.6	27.8 (82.0) / 9.6
Engine Air Dew Pt., °C (°F)	13.7 (56.7)	13.7 (56.7)	13.8 (56.8)	14.1 (57.4)
Engine Air Temp, °C (°F)	22.6 (72.7)	22.8 (73.0)	22.8 (73.0)	22.8 (73.0)
Engine Air: RH,% / AH, g/kg	57 / 10.1	57 / 10.1	57 / 10.2	58 / 10.4
NOx Humidity C.F.	.990	.990	.990	.994
Dry-to-Wet C.F.	.975	.976	.979	.982
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	59.29 (2,246.5)	59.17 (2,242.0)	59.52 (2,255.4)	59.64 (2,260.1)
90mm Sample Rate, scmm (scfm)*	0.0514 (1.95)	0.0546 (2.07)	0.0562 (2.13)	0.0570 (2.16)
Total Volume, scm (scf)*	890.1 (33,727)	888.3 (33,661)	893.6 (33,864)	597.0 (22,623)
HC Sample Meter/Range/ppm	0.0/0/18.0	0.0/0/19.3	0.0/0/20.0	0.0/0/30.6
HC Bckgrd Meter/Range/ppm	5.3/100/5.4	5.3/100/5.4	4.7/100/4.8	7.0/100/7.1
CO Sample Meter/Range/ppm (Dry)	11.8/100/11.2	11.9/100/11.3	23.0/100/22.1	34.7/100/33.6
CO Bckgrd Meter/Range/ppm	0.6/100/0.6	0.2/100/0.2	1.0/100/0.9	1.0/100/0.9
CO2 Sample Meter/Range/% (Wet)	61.5/2/1.1551	92.5/1/0.9182	75.2/1/0.6549	40.3/1/0.2780
CO2 Bckgrd Meter/Range/%	2.9/2/0.0477	8.3/1/0.0488	8.2/1/0.0482	8.0/1/0.0469
NOx Sample Meter/Range/ppm (Dry)	0.0/0/73.7	0.0/0/53.7	0.0/0/37.9	0.0/0/17.1
NOx Bckgrd Meter/Range/ppm	0.9/25/0.2	0.9/25/0.2	0.5/25/0.1	0.3/25/0.1
CH4 Sample Meter/Range/ppm	2.0	2.0	2.3	2.5
CH4 Bckgrd Meter/Range/ppm	2.4	2.3	2.3	2.2
Dilution Factor	11.60	14.58	20.38	47.23
HC Concentration, ppm	13.13	14.28	15.51	23.67
CO Concentration, ppm	10.32	10.79	20.67	32.12
CO2 Concentration, %	1.11	0.87	0.61	0.23
NOx Concentration, ppm	71.61	52.24	36.98	16.69
HC Mass, grams	7.35	7.93	8.63	8.80
CO Mass, grams	11.48	11.98	23.08	23.96
CO2 Mass, grams	19,422.78	15,220.58	10,685.87	2,720.35
NOx Mass, grams	129.44	94.24	67.17	20.33
Part. Mass, grams	6.079	2.983	2.043	0.966
Fuel, kg (lb)	6.393 (14.10)	5.013 (11.05)	3.530 (7.78)	0.915 (2.02)
KW-HR (hp-hr)	28.89 (38.74)	21.73 (29.14)	14.55 (19.51)	2.04 (2.73)
Filter Number	7477	7478	7479	7480
Weight Gain, mg	5.269	2.752	1.928	0.923
Sample Multiplier	1.154	1.084	1.059	1.047
Blower 1, scf	33,698.2	33,630.1	33,831.6	22,601.3
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.130	31.069	31.020	20.738
Gas Meter 2, scf	60.362	62.127	62.983	42.355

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 10% ETHANOL 4937

Test No.: 68-4937-1-CORR
 Date: 12/08/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 10%EtOH, EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0.000
 RUN 95

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.3 (29.04)	98.3 (29.03)	98.3 (29.03)	98.3 (29.03)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.8 (82.0) / 9.6	28.3 (83.0) / 9.3	28.3 (83.0) / 9.3	27.8 (82.0) / 9.6
Engine Air Dew Pt., °C (°F)	14.3 (57.8)	14.6 (58.2)	14.8 (58.6)	14.9 (58.8)
Engine Air Temp, °C (°F)	23.4 (74.1)	24.4 (76.0)	23.9 (75.0)	25.2 (77.4)
Engine Air: RH,% / AH, g/kg	57 / 10.5	54 / 10.7	57 / 10.9	53 / 10.9
NOx Humidity C.F.	.997	1.000	1.003	1.004
Dry-to-Wet C.F.	.976	.978	.980	.984
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	59.44 (2,252.3)	59.39 (2,250.3)	59.45 (2,252.9)	59.94 (2,271.3)
90mm Sample Rate, scmm (scfm)*	0.0584 (2.21)	0.0557 (2.11)	0.0566 (2.14)	0.0569 (2.15)
Total Volume, scm (scf)*	595.0 (22,545)	594.4 (22,524)	595.1 (22,550)	899.9 (34,101)
HC Sample Meter/Range/ppm	0.0/0/15.7	0.0/0/14.3	0.0/0/13.3	0.0/0/8.5
HC Bckgrd Meter/Range/ppm	5.4/100/5.5	4.6/100/4.7	4.6/100/4.7	4.5/100/4.6
CO Sample Meter/Range/ppm (Dry)	12.0/100/11.4	5.9/100/5.6	9.5/100/9.0	5.0/100/4.7
CO Bckgrd Meter/Range/ppm	0.3/100/0.3	0.1/100/0.1	0.2/100/0.2	0.8/100/0.8
CO2 Sample Meter/Range/% (Wet)	94.5/1/0.9526	80.5/1/0.7293	63.2/1/0.5051	14.5/1/0.0875
CO2 Bckgrd Meter/Range/%	0.9/1/0.0051	7.9/1/0.0463	8.0/1/0.0469	7.8/1/0.0457
NOx Sample Meter/Range/ppm (Dry)	0.0/0/66.6	0.0/0/49.2	0.0/0/35.4	0.0/0/3.5
NOx Bckgrd Meter/Range/ppm	0.7/25/0.2	0.2/25/0.1	0.3/25/0.1	0.4/25/0.1
CH4 Sample Meter/Range/ppm	2.6	2.4	2.4	2.6
CH4 Bckgrd Meter/Range/ppm	2.6	2.5	2.5	2.6
Dilution Factor	14.06	18.37	26.48	151.23
HC Concentration, ppm	10.60	9.90	8.82	3.98
CO Concentration, ppm	10.80	5.34	8.63	3.91
CO2 Concentration, %	0.95	0.69	0.46	0.04
NOx Concentration, ppm	64.80	48.09	34.58	3.34
HC Mass, grams	3.93	3.66	3.26	2.23
CO Mass, grams	8.03	3.96	6.42	4.39
CO2 Mass, grams	11,071.64	7,999.91	5,373.92	743.86
NOx Mass, grams	78.88	58.66	42.35	6.19
Part. Mass, grams	4.283	2.172	1.155	0.437
Fuel, kg (lb)	3.645 (8.04)	2.633 (5.81)	1.772 (3.91)	0.249 (0.55)
KW-HR (hp-hr)	16.25 (21.79)	12.21 (16.38)	8.20 (11.00)	0.02 (0.03)
Filter Number	7481	7482	7483	7484
Weight Gain, mg	4.206	2.034	1.098	0.414
Sample Multiplier	1.018	1.068	1.052	1.055
Blower 1, scf	22,523.0	22,503.2	22,528.6	34,068.9
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	20.728	20.718	20.715	31.101
Gas Meter 2, scf	42.866	41.808	42.152	63.420

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 10% ETHANOL 4937

Test No.: 68-4937-2-CORR
 Date: 12/09/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 10%EtOH, EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0.000
 RUN 99

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	404.0	900	2,001	404.0	56.6	72.2	12.1	28.94	1.025	0.982	0.972	1.008
2	2,000	75.0	303.0	900	2,000	304.0	44.2	72.1	11.4	28.96	1.013	0.991	0.975	1.007
3	2,000	50.0	202.0	900	2,001	203.0	31.1	72.0	10.9	28.97	1.003	0.998	0.983	1.005
4	2,000	10.0	40.4	600	2,001	43.0	12.1	73.0	10.7	28.98	1.000	1.000	0.985	1.008
5	1,400	100.0	488.0	600	1,400	488.0	45.7	74.0	10.6	28.98	0.998	1.001	0.980	1.011
6	1,400	75.0	366.0	600	1,400	366.0	34.2	74.5	10.6	28.98	0.998	1.001	0.984	1.012
7	1,400	50.0	244.0	600	1,401	247.0	23.7	75.0	10.6	28.98	0.998	1.001	0.986	1.013
8	800	0.0	0.0	900	803	1.0	2.1	77.0	10.6	28.98	0.997	1.002	0.985	1.019

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	153.9	32.85	0.12	32.73	47.1	518.3	23.61	77,950
2	115.8	33.20	0.07	33.12	47.6	377.0	11.51	60,920
3	77.1	35.27	0.24	35.02	97.0	268.4	8.34	42,635
4	16.3	51.58	0.62	50.95	141.9	122.2	5.62	16,304
5	130.0	24.07	0.02	24.05	51.6	478.6	27.94	62,996
6	97.4	20.60	0.00	20.60	24.1	352.9	12.67	47,078
7	65.8	20.28	0.09	20.19	38.6	255.3	6.48	32,563
8	0.2	10.79	0.31	10.49	20.7	26.0	1.67	2,800

Weighted Results									
Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
5	.100	13.0	2.41	0.00	2.41	5.16	47.86	2.79	6,300
6	.100	9.7	2.06	0.00	2.06	2.41	35.29	1.27	4,708
7	.100	6.6	2.03	0.01	2.02	3.86	25.53	0.65	3,256
8	.150	0.0	1.62	0.05	1.57	3.11	3.89	0.25	420
1	.150	23.1	4.93	0.02	4.91	7.07	77.74	3.54	11,692
2	.150	17.4	4.98	0.01	4.97	7.15	56.55	1.73	9,138
3	.150	11.6	5.29	0.04	5.25	14.56	40.26	1.25	6,395
4	.100	1.6	5.16	0.06	5.10	14.19	12.22	0.56	1,630
Total		83.0	28.47	0.18	28.28	57.50	299.36	12.04	43,540

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 10% ETHANOL 4937

Test No.: 68-4937-2-CORR
 Date: 12/09/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 10%EtOH, EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0.000
 RUN 99

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.06	0.00	0.06	0.09	0.94	0.043	141
2	0.06	0.00	0.06	0.09	0.68	0.021	110
3	0.06	0.00	0.06	0.18	0.49	0.015	77
4	0.06	0.00	0.06	0.17	0.15	0.007	20
5	0.03	0.00	0.03	0.06	0.58	0.034	76
6	0.02	0.00	0.02	0.03	0.43	0.015	57
7	0.02	0.00	0.02	0.05	0.31	0.008	39
8	0.02	0.00	0.02	0.04	0.05	0.003	5

Composite Results

BSHC	=	0.34 g/hp-hr	=	0.46 g/kW-hr
BSCO	=	0.69 g/hp-hr	=	0.93 g/kW-hr
BSNOx	=	3.61 g/hp-hr	=	4.84 g/kW-hr
Particulate	=	0.145 g/hp-hr	=	0.195 g/kW-hr
BSCO2	=	525 g/hp-hr	=	704 g/kW-hr
BSFC	=	0.382 lb/hp-hr	=	0.232 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.34 g/hp-hr	=	0.46 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L	Test No.: 68-4937-2-CORR	DIESEL 10%EtOH, EM-4937-F
Engine Desc.: 6.8 L (415 CID) IL6	Date: 12/09/2003 Time:	HCR: 1.907 FID Resp: 1.00
Engine Cycle: Diesel	Program SSDIL: 2.32-R	H= 0.133 C= 0.831 O= 0.036 X= 0.000
Engine S/N: 6068EXP000098	Cell: 16 Bag Cart: 1	
10% ETHANOL 4937	LONG TEST 20X20	RUN 99

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.0 (28.94)	98.1 (28.96)	98.1 (28.97)	98.1 (28.98)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 10.8	25.0 (77.0) / 10.1	26.7 (80.0) / 6.7	26.7 (80.0) / 8.0
Engine Air Dew Pt., °C (°F)	16.3 (61.4)	15.5 (59.9)	14.8 (58.6)	14.6 (58.2)
Engine Air Temp, °C (°F)	22.3 (72.2)	22.3 (72.1)	22.2 (72.0)	22.8 (73.0)
Engine Air: RH,% / AH, g/kg	69 / 12.1	65 / 11.4	63 / 10.9	60 / 10.7
NOx Humidity C.F.	1.025	1.013	1.003	1.000
Dry-to-Wet C.F.	.972	.975	.983	.985
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	58.99 (2,235.4)	59.51 (2,255.0)	59.69 (2,261.9)	59.56 (2,257.1)
90mm Sample Rate, scmm (scfm)*	0.0517 (1.96)	0.0549 (2.08)	0.0565 (2.14)	0.0572 (2.17)
Total Volume, scm (scf)*	885.7 (33,561)	893.5 (33,856)	896.2 (33,960)	596.2 (22,592)
HC Sample Meter/Range/ppm	0.0/0/20.9	0.0/0/21.9	0.0/0/22.0	0.0/0/29.4
HC Bckgrd Meter/Range/ppm	6.5/100/6.6	7.4/100/7.5	6.4/100/6.5	6.3/100/6.4
CO Sample Meter/Range/ppm (Dry)	12.3/100/11.7	11.7/100/11.1	23.4/100/22.5	33.8/100/32.8
CO Bckgrd Meter/Range/ppm	0.7/100/0.7	0.1/100/0.1	0.4/100/0.4	0.5/100/0.5
CO2 Sample Meter/Range/% (Wet)	62.2/2/1.1703	92.4/1/0.9165	75.0/1/0.6522	40.1/1/0.2763
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	8.8/1/0.0518	8.3/1/0.0488	7.7/1/0.0451
NOx Sample Meter/Range/ppm (Dry)	0.0/0/72.0	0.0/0/52.4	0.0/0/37.2	0.0/0/17.1
NOx Bckgrd Meter/Range/ppm	1.8/25/0.5	1.4/25/0.4	1.0/25/0.3	0.9/25/0.2
CH4 Sample Meter/Range/ppm	1.9	1.9	2.1	2.2
CH4 Bckgrd Meter/Range/ppm	2.1	2.0	2.1	2.0
Dilution Factor	11.45	14.60	20.46	47.55
HC Concentration, ppm	14.91	14.94	15.82	23.16
CO Concentration, ppm	10.65	10.67	21.67	31.75
CO2 Concentration, %	1.12	0.87	0.61	0.23
NOx Concentration, ppm	69.53	50.74	36.37	16.64
HC Mass, grams	8.21	8.30	8.82	8.60
CO Mass, grams	11.79	11.91	24.26	23.65
CO2 Mass, grams	19,487.46	15,229.96	10,658.65	2,717.34
NOx Mass, grams	129.57	94.25	67.10	20.37
Part. Mass, grams	6.008	2.905	2.089	0.937
Fuel, kg (lb)	6.415 (14.15)	5.017 (11.06)	3.522 (7.77)	0.913 (2.01)
KW-HR (hp-hr)	28.69 (38.47)	21.58 (28.94)	14.38 (19.28)	2.03 (2.72)
Filter Number	7506	7534	7582	7583
Weight Gain, mg	5.258	2.676	1.976	0.900
Sample Multiplier	1.143	1.085	1.057	1.041
Blower 1, scf	33,531.7	33,825.3	33,928.0	22,570.8
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.091	31.060	30.856	20.527
Gas Meter 2, scf	60.461	62.253	62.985	42.220

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 10% ETHANOL 4937

Test No.: 68-4937-2-CORR
 Date: 12/09/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 10%EtOH, EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0.000
 RUN 99

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.1 (28.98)	98.1 (28.98)	98.1 (28.98)	98.1 (28.98)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.7 (80.0) / 6.7	27.2 (81.0) / 5.8	27.2 (81.0) / 5.8	27.2 (81.0) / 9.1
Engine Air Dew Pt., °C (°F)	14.4 (57.9)	14.4 (57.9)	14.4 (57.9)	14.3 (57.8)
Engine Air Temp, °C (°F)	23.3 (74.0)	23.6 (74.5)	23.9 (75.0)	25.0 (77.0)
Engine Air: RH,% / AH, g/kg	57 / 10.6	56 / 10.6	55 / 10.6	52 / 10.6
NOx Humidity C.F.	.998	.998	.998	.997
Dry-to-Wet C.F.	.980	.984	.986	.985
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	59.31 (2,247.3)	59.39 (2,250.3)	59.08 (2,238.7)	59.23 (2,244.4)
90mm Sample Rate, scmm (scfm)*	0.0532 (2.02)	0.0561 (2.12)	0.0569 (2.16)	0.0576 (2.18)
Total Volume, scm (scf)*	593.6 (22,493)	594.4 (22,525)	591.3 (22,408)	889.3 (33,698)
HC Sample Meter/Range/ppm	0.0/0/16.7	0.0/0/15.3	0.0/0/15.5	0.0/0/11.6
HC Bckgrd Meter/Range/ppm	6.2/100/6.3	6.4/100/6.5	6.5/100/6.6	6.7/100/6.8
CO Sample Meter/Range/ppm (Dry)	12.8/100/12.2	6.7/100/6.3	10.3/100/9.8	6.3/100/6.0
CO Bckgrd Meter/Range/ppm	0.3/100/0.3	0.9/100/0.8	1.0/100/0.9	1.3/100/1.2
CO2 Sample Meter/Range/% (Wet)	94.2/1/0.9474	79.8/1/0.7191	64.0/1/0.5144	14.1/1/0.0849
CO2 Bckgrd Meter/Range/%	8.5/1/0.0500	8.4/1/0.0494	8.3/1/0.0488	7.7/1/0.0451
NOx Sample Meter/Range/ppm (Dry)	0.0/0/67.4	0.0/0/49.6	0.0/0/36.2	0.0/0/3.8
NOx Bckgrd Meter/Range/ppm	2.2/25/0.6	2.0/25/0.5	2.2/25/0.6	0.7/25/0.2
CH4 Sample Meter/Range/ppm	1.8	1.8	1.9	2.0
CH4 Bckgrd Meter/Range/ppm	1.9	2.0	2.0	1.9
Dilution Factor	14.13	18.62	25.98	155.02
HC Concentration, ppm	10.87	9.20	9.19	4.86
CO Concentration, ppm	11.59	5.40	8.71	4.67
CO2 Concentration, %	0.90	0.67	0.47	0.04
NOx Concentration, ppm	65.61	48.31	35.13	3.57
HC Mass, grams	4.01	3.43	3.38	2.70
CO Mass, grams	8.60	4.01	6.43	5.19
CO2 Mass, grams	10,499.26	7,846.33	5,427.24	699.95
NOx Mass, grams	79.77	58.82	42.56	6.49
Part. Mass, grams	4.651	2.108	1.079	0.417
Fuel, kg (lb)	3.457 (7.62)	2.583 (5.69)	1.789 (3.95)	0.235 (0.52)
KW-HR (hp-hr)	16.15 (21.66)	12.11 (16.24)	8.17 (10.96)	0.04 (0.05)
Filter Number	7584	7585	7586	7587
Weight Gain, mg	4.172	1.988	1.039	0.405
Sample Multiplier	1.115	1.060	1.039	1.029
Blower 1, scf	22,473.0	22,503.3	22,386.5	33,665.6
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	20.513	20.492	20.510	30.720
Gas Meter 2, scf	40.691	41.734	42.084	63.461

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 15% ETHANOL 4949

Test No.: 68-4949-1-CORR
 Date: 12/02/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 15%EtOH, EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0.000
 RUN 71

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	398.0	900	2,000	398.0	56.1	72.0	11.0	29.47	1.005	0.997	0.973	0.994
2	2,000	75.0	298.5	900	2,000	300.0	43.1	72.1	11.3	29.47	1.012	0.992	0.976	0.994
3	2,000	50.0	199.0	900	2,001	202.0	30.4	73.0	11.3	29.47	1.012	0.992	0.978	0.997
4	2,000	10.0	39.8	600	2,001	41.0	12.0	72.0	11.0	29.48	1.005	0.997	0.981	0.993
5	1,400	100.0	476.0	600	1,400	476.0	44.9	72.6	10.8	29.48	1.001	0.999	0.976	0.995
6	1,400	75.0	357.0	600	1,400	362.0	34.4	75.0	11.0	29.47	1.005	0.997	0.978	1.002
7	1,400	50.0	238.0	600	1,400	240.0	23.2	75.0	10.9	29.46	1.004	0.997	0.980	1.002
8	800	0.0	0.0	900	803	0.0	2.1	76.0	10.9	29.54	1.004	0.997	0.984	1.003

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	151.5	32.97	0.62	32.35	45.6	512.6	18.88	76,916
2	114.2	34.34	0.00	34.34	46.3	373.8	9.05	59,064
3	76.7	39.24	0.28	38.96	115.3	269.4	7.75	41,536
4	15.7	59.61	0.63	58.98	158.4	118.1	7.00	16,043
5	126.7	25.42	0.00	25.42	43.6	468.1	20.96	61,617
6	96.3	22.40	0.19	22.21	25.5	346.9	11.25	47,149
7	64.0	23.61	0.00	23.61	46.6	258.1	5.89	31,715
8	0.1	9.15	0.96	8.19	21.4	24.6	1.90	2,769

Weighted Results									
Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	22.7	4.94	0.09	4.85	6.85	76.89	2.83	11,537
2	.150	17.1	5.15	0.00	5.15	6.94	56.07	1.36	8,860
3	.150	11.5	5.89	0.04	5.84	17.29	40.42	1.16	6,230
4	.100	1.6	5.96	0.06	5.90	15.84	11.81	0.70	1,604
5	.100	12.7	2.54	0.00	2.54	4.36	46.81	2.10	6,162
6	.100	9.6	2.24	0.02	2.22	2.55	34.69	1.12	4,715
7	.100	6.4	2.36	0.00	2.36	4.66	25.81	0.59	3,171
8	.150	0.0	1.37	0.14	1.23	3.22	3.70	0.28	415
Total		81.6	30.46	0.36	30.10	61.70	296.19	10.15	42,695

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 15% ETHANOL 4949

Test No.: 68-4949-1-CORR
 Date: 12/02/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 15%EtOH, EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0.000
 RUN 71

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.06	0.00	0.06	0.08	0.94	0.035	141
2	0.06	0.00	0.06	0.09	0.69	0.017	109
3	0.07	0.00	0.07	0.21	0.50	0.014	76
4	0.07	0.00	0.07	0.19	0.14	0.009	20
5	0.03	0.00	0.03	0.05	0.57	0.026	75
6	0.03	0.00	0.03	0.03	0.43	0.014	58
7	0.03	0.00	0.03	0.06	0.32	0.007	39
8	0.02	0.00	0.02	0.04	0.05	0.003	5

Composite Results

BSHC	=	0.37 g/hp-hr	=	0.50 g/kW-hr
BSCO	=	0.76 g/hp-hr	=	1.01 g/kW-hr
BSNOx	=	3.63 g/hp-hr	=	4.87 g/kW-hr
Particulate	=	0.124 g/hp-hr	=	0.167 g/kW-hr
BSCO2	=	523 g/hp-hr	=	701 g/kW-hr
BSFC	=	0.382 lb/hp-hr	=	0.233 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.01 g/kW-hr
NMHC	=	0.37 g/hp-hr	=	0.49 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 15% ETHANOL 4949

Test No.: 68-4949-1-CORR
 Date: 12/02/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 15%EtOH, EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0.000
 RUN 71

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.8 (29.47)	99.8 (29.47)	99.8 (29.47)	99.8 (29.48)
Dil. Air: Temp, °C (°F) / AH, g/kg	24.4 (76.0) / 10.1	25.6 (78.0) / 9.6	26.7 (80.0) / 9.8	26.1 (79.0) / 10.1
Engine Air Dew Pt., °C (°F)	15.2 (59.3)	15.7 (60.2)	15.7 (60.2)	15.2 (59.3)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.3 (72.1)	22.8 (73.0)	22.2 (72.0)
Engine Air: RH,% / AH, g/kg	64 / 11.0	66 / 11.3	64 / 11.3	64 / 11.0
NOx Humidity C.F.	1.005	1.012	1.012	1.005
Dry-to-Wet C.F.	.973	.976	.978	.981
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	60.89 (2,307.2)	60.74 (2,301.6)	60.77 (2,302.9)	60.98 (2,310.8)
90mm Sample Rate, scmm (scfm)*	0.0543 (2.06)	0.0569 (2.16)	0.0577 (2.19)	0.0583 (2.21)
Total Volume, scm (scf)*	914.1 (34,639)	911.9 (34,557)	912.5 (34,576)	610.4 (23,130)
HC Sample Meter/Range/ppm	0.0/0/18.5	0.0/0/19.1	0.0/0/21.4	0.0/0/30.1
HC Bckgrd Meter/Range/ppm	4.3/100/4.4	4.4/100/4.5	4.2/100/4.3	3.9/100/4.0
CO Sample Meter/Range/ppm (Dry)	11.3/100/10.7	11.5/100/10.9	27.0/100/26.1	36.5/100/35.4
CO Bckgrd Meter/Range/ppm	0.4/100/0.4	0.5/100/0.5	0.1/100/0.1	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	60.0/2/1.1227	89.7/1/0.8715	73.0/1/0.6256	39.1/1/0.2679
CO2 Bckgrd Meter/Range/%	3.4/2/0.0559	8.5/1/0.0500	8.2/1/0.0482	7.8/1/0.0457
NOx Sample Meter/Range/ppm (Dry)	0.0/0/70.0	0.0/0/50.7	0.0/0/36.5	0.0/0/16.0
NOx Bckgrd Meter/Range/ppm	0.5/25/0.1	0.6/25/0.2	0.5/25/0.1	0.3/25/0.1
CH4 Sample Meter/Range/ppm	2.2	2.1	2.2	2.3
CH4 Bckgrd Meter/Range/ppm	2.2	2.5	2.2	2.1
Dilution Factor	12.00	15.44	21.42	49.21
HC Concentration, ppm	14.49	14.91	17.31	26.19
CO Concentration, ppm	9.99	10.16	25.28	34.61
CO2 Concentration, %	1.07	0.82	0.58	0.22
NOx Concentration, ppm	67.99	49.36	35.56	15.65
HC Mass, grams	8.24	8.58	9.81	9.93
CO Mass, grams	11.41	11.57	28.81	26.40
CO2 Mass, grams	19,228.95	14,766.08	10,383.88	2,673.89
NOx Mass, grams	128.15	93.44	67.36	19.69
Part. Mass, grams	4.737	2.282	1.953	1.171
Fuel, kg (lb)	6.361 (14.03)	4.888 (10.78)	3.452 (7.61)	0.906 (2.00)
KW-HR (hp-hr)	28.24 (37.87)	21.29 (28.55)	14.30 (19.17)	1.95 (2.61)
Filter Number	7124	7140	7141	7142
Weight Gain, mg	4.224	2.136	1.854	1.118
Sample Multiplier	1.122	1.068	1.054	1.047
Blower 1, scf	34,608.2	34,524.6	34,543.6	23,107.8
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.709	31.566	31.527	21.082
Gas Meter 2, scf	62.594	63.916	64.345	43.171

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 15% ETHANOL 4949

Test No.: 68-4949-1-CORR
 Date: 12/02/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 15%EtOH, EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0.000
 RUN 71

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.8 (29.48)	99.8 (29.47)	99.8 (29.46)	100.0 (29.54)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.7 (80.0) / 9.8	26.7 (80.0) / 9.8	26.7 (80.0) / 9.8	26.7 (80.0) / 9.8
Engine Air Dew Pt., °C (°F)	14.9 (58.8)	15.2 (59.3)	15.1 (59.2)	15.2 (59.3)
Engine Air Temp, °C (°F)	22.6 (72.6)	23.9 (75.0)	23.9 (75.0)	24.4 (76.0)
Engine Air: RH,% / AH, g/kg	62 / 10.8	58 / 11.0	58 / 10.9	56 / 10.9
NOx Humidity C.F.	1.001	1.005	1.004	1.004
Dry-to-Wet C.F.	.976	.978	.980	.984
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	60.70 (2,300.2)	60.67 (2,299.0)	60.76 (2,302.6)	61.52 (2,331.3)
90mm Sample Rate, scmm (scfm)*	0.0555 (2.10)	0.0573 (2.17)	0.0583 (2.21)	0.0587 (2.22)
Total Volume, scm (scf)*	607.6 (23,023)	607.3 (23,011)	608.2 (23,048)	923.7 (35,002)
HC Sample Meter/Range/ppm	0.0/0/15.4	0.0/0/14.5	0.0/0/14.3	0.0/0/9.3
HC Bckgrd Meter/Range/ppm	4.5/100/4.6	4.8/100/4.9	4.0/100/4.1	5.3/100/5.4
CO Sample Meter/Range/ppm (Dry)	10.5/100/10.0	6.2/100/5.9	11.3/100/10.7	5.1/100/4.8
CO Bckgrd Meter/Range/ppm	0.1/100/0.1	0.1/100/0.1	0.3/100/0.3	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	91.7/1/0.9047	78.8/1/0.7048	62.0/1/0.4914	15.1/1/0.0914
CO2 Bckgrd Meter/Range/%	8.0/1/0.0469	8.2/1/0.0482	8.6/1/0.0506	9.1/1/0.0536
NOx Sample Meter/Range/ppm (Dry)	0.0/0/64.1	0.0/0/47.4	0.0/0/35.3	0.0/0/3.5
NOx Bckgrd Meter/Range/ppm	0.4/25/0.1	0.7/25/0.2	0.9/25/0.2	0.7/25/0.2
CH4 Sample Meter/Range/ppm	2.2	2.1	2.1	2.5
CH4 Bckgrd Meter/Range/ppm	2.5	2.1	2.2	2.2
Dilution Factor	14.88	19.10	27.34	145.50
HC Concentration, ppm	11.10	9.89	10.41	3.94
CO Concentration, ppm	9.57	5.61	10.22	4.64
CO2 Concentration, %	0.86	0.66	0.44	0.04
NOx Concentration, ppm	62.50	46.17	34.32	3.24
HC Mass, grams	4.24	3.73	3.93	2.29
CO Mass, grams	7.26	4.26	7.76	5.36
CO2 Mass, grams	10,269.43	7,858.22	5,285.80	692.17
NOx Mass, grams	78.01	57.82	43.01	6.16
Part. Mass, grams	3.497	1.881	0.984	0.476
Fuel, kg (lb)	3.397 (7.49)	2.600 (5.73)	1.753 (3.86)	0.234 (0.51)
KW-HR (hp-hr)	15.74 (21.11)	11.97 (16.05)	7.96 (10.67)	0.01 (0.02)
Filter Number	7143	7144	7145	7146
Weight Gain, mg	3.194	1.774	0.943	0.454
Sample Multiplier	1.095	1.060	1.044	1.049
Blower 1, scf	23,001.6	22,989.7	23,026.1	34,969.1
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	21.040	21.016	21.018	31.615
Gas Meter 2, scf	42.069	42.719	43.095	64.980

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 15% ETHANOL 4949

Test No.: 68-4949-2-CORR
 Date: 12/03/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 15%EtOH, EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0.000
 RUN 78

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,000	100.0	394.0	900	1,999	394.0	54.9	72.0	10.5	29.20	0.997	1.002	0.970	1.000
2	2,000	75.0	295.5	900	2,000	298.0	42.8	72.0	10.8	29.20	1.002	0.999	0.976	1.000
3	2,000	50.0	197.0	900	2,001	201.0	30.4	72.0	10.9	29.21	1.003	0.998	0.979	1.000
4	2,000	10.0	39.4	600	2,001	41.0	11.8	71.0	11.1	29.21	1.007	0.995	0.981	0.997
5	1,400	100.0	476.0	600	1,400	476.0	45.6	73.0	11.0	29.22	1.006	0.996	0.975	1.002
6	1,400	75.0	357.0	600	1,400	357.0	33.6	75.0	11.2	29.22	1.009	0.994	0.977	1.008
7	1,400	50.0	238.0	600	1,400	239.0	22.6	74.0	11.1	29.22	1.007	0.995	0.979	1.005
8	800	0.0	0.0	900	802	-2.0	2.0	75.0	11.0	29.22	1.006	0.996	0.983	1.008

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	149.8	34.14	0.00	34.14	45.8	499.4	18.72	75,312
2	113.5	34.13	0.00	34.13	48.1	366.5	9.08	58,569
3	76.7	41.96	0.29	41.68	118.4	270.8	7.86	41,501
4	15.5	59.83	0.75	59.08	157.4	118.9	6.86	15,804
5	126.7	25.19	0.00	25.19	45.6	466.5	21.74	62,492
6	95.0	23.27	0.19	23.08	23.9	342.5	10.48	46,100
7	63.7	23.52	0.00	23.52	47.3	257.9	5.76	30,954
8	0.0	8.20	0.07	8.13	19.6	25.7	1.51	2,651

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	22.5	5.12	0.00	5.12	6.87	74.91	2.81	11,297
2	.150	17.0	5.12	0.00	5.12	7.22	54.98	1.36	8,785
3	.150	11.5	6.29	0.04	6.25	17.76	40.62	1.18	6,225
4	.100	1.6	5.98	0.08	5.91	15.74	11.89	0.69	1,580
5	.100	12.7	2.52	0.00	2.52	4.56	46.65	2.17	6,249
6	.100	9.5	2.33	0.02	2.31	2.39	34.25	1.05	4,610
7	.100	6.4	2.35	0.00	2.35	4.73	25.79	0.58	3,095
8	.150	0.0	1.23	0.01	1.22	2.94	3.86	0.23	398
Total		81.1	30.95	0.15	30.80	62.21	292.94	10.06	42,240

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
 15% ETHANOL 4949

Test No.: 68-4949-2-CORR
 Date: 12/03/2003 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 LONG TEST 20X20

DIESEL 15%EtOH, EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0.000
 RUN 78

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.06	0.00	0.06	0.08	0.92	0.035	139
2	0.06	0.00	0.06	0.09	0.68	0.017	108
3	0.08	0.00	0.08	0.22	0.50	0.015	77
4	0.07	0.00	0.07	0.19	0.15	0.008	19
5	0.03	0.00	0.03	0.06	0.58	0.027	77
6	0.03	0.00	0.03	0.03	0.42	0.013	57
7	0.03	0.00	0.03	0.06	0.32	0.007	38
8	0.02	0.00	0.02	0.04	0.05	0.003	5

Composite Results

BSHC	=	0.38 g/hp-hr	=	0.51 g/kW-hr
BSCO	=	0.77 g/hp-hr	=	1.03 g/kW-hr
BSNOx	=	3.61 g/hp-hr	=	4.84 g/kW-hr
Particulate	=	0.124 g/hp-hr	=	0.166 g/kW-hr
BSCO2	=	521 g/hp-hr	=	699 g/kW-hr
BSFC	=	0.381 lb/hp-hr	=	0.232 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.38 g/hp-hr	=	0.51 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L	Test No.: 68-4949-2-CORR	DIESEL 15%EtOH, EM-4949-F
Engine Desc.: 6.8 L (415 CID) IL6	Date: 12/03/2003 Time:	HCR: 1.887 FID Resp: 1.00
Engine Cycle: Diesel	Program SSDIL: 2.32-R	H= 0.131 C= 0.827 O= 0.042 X= 0.000
Engine S/N: 6068EXP000098	Cell: 16 Bag Cart: 1	
15% ETHANOL 4949	LONG TEST 20X20	RUN 78

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.9 (29.20)	98.9 (29.20)	98.9 (29.21)	98.9 (29.21)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.6 (78.0) / 11.9	25.6 (78.0) / 9.7	26.1 (79.0) / 9.5	26.1 (79.0) / 10.2
Engine Air Dew Pt., °C (°F)	14.4 (57.9)	14.8 (58.6)	14.9 (58.8)	15.2 (59.3)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.2 (72.0)	21.7 (71.0)
Engine Air: RH,% / AH, g/kg	61 / 10.5	63 / 10.8	63 / 10.9	67 / 11.1
NOx Humidity C.F.	.997	1.002	1.003	1.007
Dry-to-Wet C.F.	.970	.976	.979	.981
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	59.62 (2,259.1)	60.19 (2,280.8)	60.04 (2,275.2)	59.76 (2,264.4)
90mm Sample Rate, scmm (scfm)*	0.0534 (2.02)	0.0564 (2.14)	0.0574 (2.18)	0.0571 (2.16)
Total Volume, scm (scf)*	895.0 (33,917)	903.7 (34,244)	901.5 (34,161)	598.1 (22,666)
HC Sample Meter/Range/ppm	0.0/0/18.9	0.0/0/19.1	0.0/0/22.5	0.0/0/30.6
HC Bckgrd Meter/Range/ppm	3.9/100/4.0	4.1/100/4.2	3.9/100/4.0	3.8/100/3.9
CO Sample Meter/Range/ppm (Dry)	12.3/100/11.7	12.5/100/11.9	28.6/100/27.6	37.1/100/36.0
CO Bckgrd Meter/Range/ppm	1.2/100/1.1	1.0/100/0.9	0.7/100/0.7	0.2/100/0.2
CO2 Sample Meter/Range/% (Wet)	60.0/2/1.1227	89.7/1/0.8715	73.4/1/0.6309	39.6/1/0.2721
CO2 Bckgrd Meter/Range/%	3.4/2/0.0559	8.4/1/0.0494	8.0/1/0.0469	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/70.7	0.0/0/50.9	0.0/0/37.5	0.0/0/16.5
NOx Bckgrd Meter/Range/ppm	1.7/25/0.4	1.4/25/0.4	0.9/25/0.2	0.8/25/0.2
CH4 Sample Meter/Range/ppm	2.0	2.0	2.2	2.4
CH4 Bckgrd Meter/Range/ppm	2.3	2.2	2.2	2.2
Dilution Factor	11.99	15.44	21.23	48.45
HC Concentration, ppm	15.26	15.17	18.74	26.82
CO Concentration, ppm	10.23	10.65	26.28	35.10
CO2 Concentration, %	1.07	0.83	0.59	0.22
NOx Concentration, ppm	68.20	49.33	36.48	16.04
HC Mass, grams	8.54	8.53	10.49	9.97
CO Mass, grams	11.44	12.03	29.60	26.23
CO2 Mass, grams	18,827.89	14,642.20	10,375.15	2,634.07
NOx Mass, grams	124.85	91.63	67.70	19.82
Part. Mass, grams	4.668	2.274	1.969	1.148
Fuel, kg (lb)	6.229 (13.73)	4.847 (10.69)	3.450 (7.61)	0.893 (1.97)
KW-HR (hp-hr)	27.92 (37.44)	21.16 (28.37)	14.30 (19.17)	1.93 (2.59)
Filter Number	7148	7149	7206	7208
Weight Gain, mg	4.179	2.127	1.882	1.096
Sample Multiplier	1.117	1.069	1.046	1.048
Blower 1, scf	33,886.2	34,211.7	34,128.2	22,644.2
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	31.278	31.264	31.295	20.890
Gas Meter 2, scf	61.642	63.301	63.949	42.523

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L	Test No.: 68-4949-2-CORR	DIESEL 15%EtOH, EM-4949-F
Engine Desc.: 6.8 L (415 CID) IL6	Date: 12/03/2003 Time:	HCR: 1.887 FID Resp: 1.00
Engine Cycle: Diesel	Program SSDIL: 2.32-R	H= 0.131 C= 0.827 O= 0.042 X= 0.000
Engine S/N: 6068EXP000098	Cell: 16 Bag Cart: 1	
15% ETHANOL 4949	LONG TEST 20X20	RUN 78

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.9 (29.22)	98.9 (29.22)	98.9 (29.22)	98.9 (29.22)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.2 (81.0) / 10.4	27.2 (81.0) / 10.4	27.2 (81.0) / 10.4	27.2 (81.0) / 10.4
Engine Air Dew Pt., °C (°F)	15.1 (59.2)	15.3 (59.6)	15.2 (59.3)	15.1 (59.2)
Engine Air Temp, °C (°F)	22.8 (73.0)	23.9 (75.0)	23.3 (74.0)	23.9 (75.0)
Engine Air: RH, % / AH, g/kg	62 / 11.0	59 / 11.2	60 / 11.1	58 / 11.0
NOx Humidity C.F.	1.006	1.009	1.007	1.006
Dry-to-Wet C.F.	.975	.977	.979	.983
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	60.06 (2,276.0)	59.83 (2,267.0)	59.58 (2,257.6)	60.01 (2,273.9)
90mm Sample Rate, scmm (scfm)*	0.0544 (2.06)	0.0568 (2.15)	0.0575 (2.18)	0.0579 (2.20)
Total Volume, scm (scf)*	601.2 (22,780)	598.8 (22,692)	596.3 (22,597)	901.0 (34,142)
HC Sample Meter/Range/ppm	0.0/0/14.8	0.0/0/13.8	0.0/0/14.0	0.0/0/7.3
HC Bckgrd Meter/Range/ppm	3.9/100/4.0	3.5/100/3.6	3.6/100/3.7	3.6/100/3.7
CO Sample Meter/Range/ppm (Dry)	11.2/100/10.7	6.0/100/5.7	11.6/100/11.0	4.8/100/4.5
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.2/100/0.2	0.2/100/0.2	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	93.0/1/0.9267	78.2/1/0.6963	61.4/1/0.4847	13.5/1/0.0811
CO2 Bckgrd Meter/Range/%	8.1/1/0.0475	7.7/1/0.0451	7.8/1/0.0457	7.5/1/0.0439
NOx Sample Meter/Range/ppm (Dry)	0.0/0/64.5	0.0/0/47.3	0.0/0/35.7	0.0/0/3.6
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	0.6/25/0.2	0.4/25/0.1	0.3/25/0.1
CH4 Sample Meter/Range/ppm	1.9	1.9	1.9	2.0
CH4 Bckgrd Meter/Range/ppm	2.1	1.9	2.1	2.0
Dilution Factor	14.53	19.34	27.72	164.11
HC Concentration, ppm	11.14	10.42	10.43	3.66
CO Concentration, ppm	10.13	5.33	10.59	4.36
CO2 Concentration, %	0.88	0.65	0.44	0.04
NOx Concentration, ppm	62.65	46.04	34.89	3.46
HC Mass, grams	4.20	3.88	3.92	2.05
CO Mass, grams	7.61	3.99	7.89	4.91
CO2 Mass, grams	10,415.28	7,683.39	5,159.01	662.75
NOx Mass, grams	77.75	57.08	42.98	6.43
Part. Mass, grams	3.638	1.758	0.965	0.378
Fuel, kg (lb)	3.446 (7.60)	2.542 (5.60)	1.711 (3.77)	0.223 (0.49)
KW-HR (hp-hr)	15.75 (21.12)	11.81 (15.84)	7.91 (10.61)	0.00 (0.00)
Filter Number	7209	7210	7211	7212
Weight Gain, mg	3.292	1.668	0.930	0.365
Sample Multiplier	1.105	1.054	1.038	1.037
Blower 1, scf	22,759.6	22,670.5	22,575.7	34,108.7
Blower 2, scf	0.0	0.0	0.0	0.0
Gas Meter 1, scf	20.837	20.831	20.840	31.234
Gas Meter 2, scf	41.449	42.360	42.618	64.159

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 8.1L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
BASELINE FUEL 20X20

Test No.: 68-4970-1-CORR
 Date: 11/25
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
RUN 63

Time: DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	448.0	900	2000	449.0	215	59.5	211.7	70.9	8.2	29.14	0.956	1.035	0.981	0.995
2	2000	75	336.0	900	2002	338.0	213.7	45.6	215.4	72.0	8.2	29.14	0.956	1.035	0.984	0.998
3	2000	50	224.0	900	2001	226.0	218.8	32.1	226.8	72.0	8.5	29.13	0.961	1.031	0.987	0.999
4	2000	10	44.8	600	2000	45.0	374.6	11.6	417.1	72.0	8.4	29.13	0.959	1.032	0.991	0.999
5	1400	100	530.0	600	1400	530.0	205.9	48.2	207.7	72.0	8.5	29.12	0.961	1.031	0.984	0.999
6	1400	75	398.0	600	1398	400.0	203.3	36.8	210.6	73.0	8.5	29.12	0.962	1.030	0.985	1.002
7	1400	50	265.0	600	1401	266.0	200.9	24.6	211.1	74.0	8.6	29.11	0.963	1.029	0.986	1.005
8	809	0	0.0	900	809	0.0	1214.5	2.1	4562.6	76.0	8.8	29.11	0.967	1.025	0.990	1.011

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	171.0	42.74	47.3	641.3	28.10	85,642	1.0	171.0	0.250	0.277	3.751	0.164	501
2	128.7	38.55	43.0	448.8	13.57	65,631	1.0	128.7	0.299	0.334	3.486	0.105	510
3	86.1	37.81	79.9	315.7	9.00	46,079	1.0	86.1	0.439	0.928	3.667	0.105	535
4	16.9	57.01	147.3	127.3	6.90	16,264	1.0	16.9	3.370	8.708	7.524	0.408	961
5	141.2	24.24	58.0	565.5	34.47	69,363	1.0	141.2	0.172	0.411	4.005	0.244	491
6	106.3	23.31	26.3	420.9	16.41	53,014	1.0	106.3	0.219	0.248	3.959	0.154	499
7	70.9	19.96	36.9	300.8	8.44	35,286	1.0	70.9	0.282	0.520	4.243	0.119	498
8	0.3	11.70	22.4	28.8	2.08	2,908	1.0	0.3	41.787	80.095	102.918	7.422	10388

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
BASELINE FUEL 20X20

Test No.: 68-4970-2-CORR
 Date: 12/1
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
RUN 67

DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	446.0	900	2000	446.0	218	60.8	217.9	72.0	10.8	29.44	1.001	0.999	0.973	0.994
2	2000	75	335.0	900	2000	338.0	215.4	46.7	221.2	73.0	11.2	29.45	1.009	0.993	0.975	0.997
3	2000	50	223.0	900	2000	225.0	222.9	33.5	238.1	72.0	11.3	29.46	1.012	0.992	0.978	0.994
4	2000	10	45.0	600	2001	44.0	403.3	12.3	445.3	72.1	11.4	29.47	1.012	0.991	0.982	0.994
5	1400	100	530.0	600	1400	529.0	207.1	49.5	213.8	73.0	11.2	29.48	1.009	0.993	0.974	0.996
6	1400	75	398.0	600	1400	402.0	205.3	37.0	210.5	75.0	11.1	29.48	1.007	0.995	0.976	1.002
7	1400	50	265.0	600	1401	266.0	203.8	24.6	211.5	74.0	11.2	29.48	1.009	0.993	0.979	0.999
8	800	0	0.0	900	810	1.0	3664.9	2.2	8363.8	75.1	11.1	29.48	1.007	0.995	0.983	1.002

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	169.8	44.41	49.1	653.7	27.69	87,528	1.0	169.8	0.262	0.289	3.851	0.163	516
2	128.4	39.32	43.5	459.3	13.50	67,094	1.0	128.4	0.306	0.339	3.576	0.105	522
3	85.6	37.99	81.7	323.1	9.40	48,031	1.0	85.6	0.444	0.954	3.775	0.110	561
4	16.8	57.56	148.8	133.5	6.90	17,324	1.0	16.8	3.426	8.858	7.945	0.411	1031
5	140.8	24.66	59.4	581.2	33.84	71,230	1.0	140.8	0.175	0.422	4.128	0.240	506
6	106.9	23.76	24.9	429.2	15.43	53,210	1.0	106.9	0.222	0.233	4.014	0.144	498
7	70.7	20.02	38.3	301.1	8.63	35,314	1.0	70.7	0.283	0.542	4.257	0.122	499
8	0.2	10.41	23.7	29.1	2.19	3,081	1.0	0.2	65.052	148.098	182.014	13.691	19258

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
7.7% ETHANOL 4930

Test No.: 68-4930-1-CORR
 Date: 12/4
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
LONG TEST 20X20

Time: DIESEL 7.7%EtOH EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.03 X= 0

RUN 82

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	414.0	900	2000	414.0	219	56.6	218.6	73.0	9.9	29.27	0.986	1.010	0.979	1.000
2	2000	75	311.0	900	2000	311.0	218.1	43.9	226.1	73.3	10.3	29.27	0.993	1.005	0.982	1.001
3	2000	50	207.0	900	2001	209.0	231.1	30.9	235.9	74.1	10.3	29.28	0.993	1.005	0.985	1.003
4	2000	10	41.0	600	2001	41.0	406.9	11.5	450.1	73.0	10.5	29.29	0.995	1.003	0.989	1.000
5	1400	100	500.0	600	1400	501.0	212.1	46.0	209.9	74.0	10.3	29.28	0.993	1.005	0.982	1.003
6	1400	75	375.0	600	1400	377.0	210.4	34.6	209.9	75.0	10.5	29.29	0.996	1.003	0.983	1.006
7	1400	50	250.0	600	1400	251.0	207.3	23.4	213.1	77.0	10.6	29.28	0.998	1.001	0.984	1.012
8	800	0	0.0	900	802	0.0	1606.2	2.1	3991.8	78.0	10.8	29.28	1.001	0.999	0.984	1.015

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	157.5	32.58	46.6	537.7	25.08	78,794	1.0	157.5	0.207	0.296	3.414	0.159	500
2	118.1	34.51	46.8	386.9	12.22	61,062	1.0	118.1	0.292	0.396	3.275	0.103	517
3	79.7	36.87	90.9	271.0	8.74	42,864	1.0	79.7	0.463	1.141	3.401	0.110	538
4	15.5	50.31	125.1	119.4	5.57	15,716	1.0	15.5	3.237	8.051	7.682	0.358	1011
5	133.3	25.53	53.8	494.1	31.49	64,025	1.0	133.3	0.192	0.404	3.706	0.236	480
6	100.3	21.79	24.3	365.4	13.75	48,103	1.0	100.3	0.217	0.242	3.644	0.137	480
7	66.8	20.31	37.4	260.5	7.06	32,498	1.0	66.8	0.304	0.560	3.901	0.106	487
8	0.3	8.97	17.4	25.7	1.76	2,831	1.0	0.3	28.040	54.238	80.296	5.505	8847

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
7.7% ETHANOL 4930

Test No.: 68-4930-2-CORR
 Date: 12/5
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
LONG TEST 20X20

Time: DIESEL 7.7%EtOH EM-4930-F
 HCR: 1.860 FID Resp: 1.00
 H= 0.131 C= 0.839 O= 0.03 X= 0

RUN 90

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	415.0	900	1999	414.0	219	56.8	219.5	71.0	10.0	29.49	0.987	1.010	0.980	0.989
2	2000	75	311.0	900	2000	314.0	218.1	44.4	226.3	73.3	10.2	29.50	0.990	1.007	0.983	0.996
3	2000	50	208.0	900	2000	210.0	230.9	31.0	235.9	74.0	10.4	29.51	0.994	1.005	0.985	0.998
4	2000	10	42.0	600	2001	43.0	401.1	12.0	445.6	74.0	10.4	29.52	0.994	1.005	0.989	0.997
5	1400	100	501.0	600	1400	501.0	208.7	46.2	210.9	74.0	10.2	29.52	0.991	1.007	0.984	0.997
6	1400	75	376.0	600	1400	377.0	209.7	34.6	209.9	75.0	10.2	29.53	0.991	1.007	0.986	1.000
7	1400	50	251.0	600	1401	253.0	208.9	23.5	212.3	74.0	10.2	29.53	0.991	1.007	0.989	0.997
8	803	0	0.0	900	803	1.0	2205.0	2.1	6386.9	77.4	10.4	29.52	0.995	1.004	0.990	1.007

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wft.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	157.4	32.64	49.0	526.5	25.46	79,032	1.0	157.4	0.207	0.311	3.345	0.162	502
2	119.4	32.84	48.1	387.3	12.82	61,706	1.0	119.4	0.275	0.403	3.245	0.107	517
3	79.9	36.48	86.4	272.3	8.79	42,993	1.0	79.9	0.456	1.082	3.407	0.110	538
4	16.4	50.38	128.0	124.5	5.80	16,412	1.0	16.4	3.076	7.815	7.599	0.354	1002
5	133.3	24.57	50.4	496.3	29.47	64,309	1.0	133.3	0.184	0.378	3.724	0.221	483
6	100.3	23.47	24.9	362.4	14.09	48,146	1.0	100.3	0.234	0.248	3.615	0.140	480
7	67.3	20.59	35.8	259.3	7.05	32,646	1.0	67.3	0.306	0.532	3.852	0.105	485
8	0.2	10.07	17.7	24.0	1.72	2,909	1.0	0.2	50.347	88.437	119.922	8.624	14545

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
10% ETHANOL 4937

Test No.: 68-4937-1-CORR
 Date: 12/8
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
LONG TEST 20X20

Time: DIESEL 10%EtOH EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0

RUN 95

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	407.0	900	2000	407.0	222	56.4	221.4	72.7	10.1	29.03	0.990	1.008	0.975	1.005
2	2000	75	305.0	900	1999	307.0	225.3	44.2	230.7	73.0	10.1	29.03	0.990	1.008	0.976	1.006
3	2000	50	204.0	900	2000	205.0	235.0	31.1	242.4	73.0	10.2	29.03	0.990	1.007	0.979	1.006
4	2000	10	41.0	600	2001	43.0	404.6	12.1	449.3	73.0	10.4	29.04	0.994	1.004	0.982	1.006
5	1400	100	490.0	600	1400	491.0	210.1	48.2	224.3	74.1	10.5	29.04	0.997	1.002	0.976	1.009
6	1400	75	368.0	600	1400	369.0	213.5	34.8	215.4	76.0	10.7	29.03	1.000	1.000	0.978	1.015
7	1400	50	245.0	600	1401	248.0	211.2	23.4	215.7	75.0	10.9	29.03	1.003	0.998	0.980	1.013
8	800	0	0.0	900	803	1.0	5368.0	2.2	11151.8	77.4	10.9	29.03	1.004	0.997	0.984	1.019

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	155.0	29.38	45.9	517.8	24.51	77,691	1.0	155.0	0.190	0.296	3.341	0.158	501
2	116.6	31.74	47.9	377.0	12.02	60,882	1.0	116.6	0.272	0.411	3.234	0.103	522
3	78.0	34.50	92.3	268.7	8.23	42,743	1.0	78.0	0.442	1.183	3.443	0.105	548
4	16.4	52.80	143.7	122.0	5.82	16,322	1.0	16.4	3.223	8.775	7.446	0.355	996
5	130.7	23.56	48.2	473.3	25.76	66,430	1.0	130.7	0.180	0.369	3.620	0.197	508
6	98.3	21.97	23.8	351.9	13.04	47,999	1.0	98.3	0.224	0.242	3.581	0.133	488
7	66.0	19.58	38.5	254.1	6.92	32,243	1.0	66.0	0.297	0.583	3.850	0.105	489
8	0.1	8.92	17.6	24.7	1.74	2,975	1.0	0.1	74.325	146.386	206.242	14.517	24795

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
10% ETHANOL 4937

Test No.: 68-4937-2-CORR
 Date: 12/9
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
LONG TEST 20X20

Time: DIESEL 10%EtOH EM-4937-F
 HCR: 1.907 FID Resp: 1.00
 H= 0.133 C= 0.831 O= 0.036 X= 0
RUN 99

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	405.0	900	2001	404.0	226	56.6	223.7	72.2	12.1	28.94	1.025	0.982	0.972	1.008
2	2000	75	304.0	900	2000	304.0	227.6	44.2	232.3	72.1	11.4	28.96	1.013	0.991	0.975	1.007
3	2000	50	203.0	900	2001	203.0	237.0	31.1	245.3	72.0	10.9	28.97	1.003	0.998	0.983	1.005
4	2000	10	41.0	600	2001	43.0	393.1	12.1	451.0	73.0	10.7	28.98	1.000	1.000	0.985	1.008
5	1400	100	489.0	600	1400	488.0	214.2	45.7	213.9	74.0	10.6	28.98	0.998	1.001	0.980	1.011
6	1400	75	366.0	600	1400	366.0	213.8	34.2	213.5	74.5	10.6	28.98	0.998	1.001	0.984	1.012
7	1400	50	245.0	600	1401	247.0	208.1	23.7	219.2	75.0	10.6	28.98	0.998	1.001	0.986	1.013
8	800	0	0.0	900	803	1.0	2682.5	2.1	6386.9	77.0	10.6	28.98	0.997	1.002	0.985	1.019

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode w.f.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	153.9	32.85	47.1	518.3	23.61	77,950	1.0	153.9	0.213	0.306	3.368	0.153	507
2	115.8	33.20	47.6	377.0	11.51	60,920	1.0	115.8	0.287	0.412	3.257	0.099	526
3	77.1	35.27	97.0	268.4	8.34	42,635	1.0	77.1	0.457	1.258	3.480	0.108	553
4	16.3	51.58	141.9	122.2	5.62	16,304	1.0	16.3	3.160	8.696	7.489	0.345	999
5	130.0	24.07	51.6	478.6	27.94	62,996	1.0	130.0	0.185	0.397	3.683	0.215	485
6	97.4	20.60	24.1	352.9	12.67	47,078	1.0	97.4	0.211	0.247	3.622	0.130	483
7	65.8	20.28	38.6	255.3	6.48	32,563	1.0	65.8	0.308	0.587	3.883	0.099	495
8	0.2	10.79	20.7	26.0	1.67	2,800	1.0	0.2	53.958	103.729	129.804	8.353	13999

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
15% ETHANOL 4949

Test No.: 68-4949-1-CORR
 Date: 12/2
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
LONG TEST 20X20

Time: DIESEL 15%EtOH EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0

RUN 71

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	397.0	900	2000	398.0	229	56.1	225.3	72.0	11.0	29.47	1.005	0.997	0.973	0.994
2	2000	75	298.0	900	2000	300.0	230.8	43.1	229.6	72.1	11.3	29.47	1.012	0.992	0.976	0.994
3	2000	50	199.0	900	2001	202.0	240.6	30.4	241.2	73.0	11.3	29.47	1.012	0.992	0.978	0.997
4	2000	10	40.0	600	2001	41.0	444.7	12.0	466.1	72.0	11.0	29.48	1.005	0.997	0.981	0.993
5	1400	100	477.0	600	1400	476.0	216.6	44.9	215.6	72.6	10.8	29.48	1.001	0.999	0.976	0.995
6	1400	75	358.0	600	1400	362.0	215.7	34.4	217.3	75.0	11.0	29.47	1.005	0.997	0.978	1.002
7	1400	50	239.0	600	1400	240.0	216.4	23.2	220.4	75.0	10.9	29.46	1.004	0.997	0.980	1.002
8	800	0	0.0	900	803	0.0	8052.1	2.1	15967.3	76.0	10.9	29.54	1.004	0.997	0.984	1.003

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	151.5	32.97	45.6	512.6	18.88	76,916	1.0	151.5	0.218	0.301	3.384	0.125	508
2	114.2	34.34	46.3	373.8	9.05	59,064	1.0	114.2	0.301	0.405	3.273	0.079	517
3	76.7	39.24	115.3	269.4	7.75	41,536	1.0	76.7	0.512	1.503	3.514	0.101	542
4	15.7	59.61	158.4	118.1	7.00	16,043	1.0	15.7	3.806	10.113	7.545	0.447	1024
5	126.7	25.42	43.6	468.1	20.96	61,617	1.0	126.7	0.201	0.344	3.695	0.166	486
6	96.3	22.40	25.5	346.9	11.25	47,149	1.0	96.3	0.233	0.265	3.603	0.117	490
7	64.0	23.61	46.6	258.1	5.89	31,715	1.0	64.0	0.369	0.728	4.031	0.092	495
8	0.1	9.15	21.4	24.6	1.90	2,769	1.0	0.1	114.430	268.000	308.121	23.740	34609

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 6.8L
 Engine Desc.: 6.8 L (415 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: 6068EXP000098
15% ETHANOL 4949

Test No.: 68-4949-2-CORR
 Date: 12/3
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
LONG TEST 20X20

Time: DIESEL 15%EtOH EM-4949-F
 HCR: 1.887 FID Resp: 1.00
 H= 0.131 C= 0.827 O= 0.042 X= 0

RUN 78

Mode	Target				Measured			C-B		Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2000	100	395.0	900	1999	394.0	229	54.9	223.0	72.0	10.5	29.20	0.997	1.002	0.970	1.000
2	2000	75	296.0	900	2000	298.0	229.5	42.8	229.4	72.0	10.8	29.20	1.002	0.999	0.976	1.000
3	2000	50	198.0	900	2001	201.0	238.2	30.4	241.2	72.0	10.9	29.21	1.003	0.998	0.979	1.000
4	2000	10	40.0	600	2001	41.0	421.7	11.8	461.9	71.0	11.1	29.21	1.007	0.995	0.981	0.997
5	1400	100	476.0	600	1400	476.0	216.3	45.6	218.9	73.0	11.0	29.22	1.006	0.996	0.975	1.002
6	1400	75	357.0	600	1400	357.0	214.7	33.6	215.0	75.0	11.2	29.22	1.009	0.994	0.977	1.008
7	1400	50	238.0	600	1400	239.0	216.5	22.6	215.9	74.0	11.1	29.22	1.007	0.995	0.979	1.005
8	800	0	0.0	900	802	-2.0	#####	2.0	#####	75.0	11.0	29.22	1.006	0.996	0.983	1.008

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	149.8	34.14	45.8	499.4	18.72	75,312	1.0	149.8	0.228	0.306	3.335	0.125	503
2	113.5	34.13	48.1	366.5	9.08	58,569	1.0	113.5	0.301	0.424	3.230	0.080	516
3	76.7	41.96	118.4	270.8	7.86	41,501	1.0	76.7	0.547	1.544	3.531	0.102	541
4	15.5	59.83	157.4	118.9	6.86	15,804	1.0	15.5	3.850	10.127	7.651	0.441	1017
5	126.7	25.19	45.6	466.5	21.74	62,492	1.0	126.7	0.199	0.360	3.681	0.172	493
6	95.0	23.27	23.9	342.5	10.48	46,100	1.0	95.0	0.245	0.252	3.604	0.110	485
7	63.7	23.52	47.3	257.9	5.76	30,954	1.0	63.7	0.369	0.743	4.051	0.091	486
8	0.0	8.20	19.6	25.7	1.51	2,651	1.0	0.0	349.912	1906.643	6433.485	376.897	662754

APPENDIX D

DETAILED EMISSIONS DATA FOR 12.5-L ENGINE

APPENDIX D
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125-4935-8M2	10% Ethanol	D-18 – D-21
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UNWEIGHTED 8-MODE TEST RESULTS

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Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL/RUN 222

Test No.: 12549708M3-COR
 Date: 02/24/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,234.0	900	2,100	1,234.0	165.5	72.2	10.5	28.90	0.997	1.003	0.971	1.007
2	2,100	75.0	925.5	900	2,101	932.0	125.7	72.4	11.0	28.89	1.005	0.996	0.975	1.009
3	2,100	50.0	617.0	900	2,103	618.0	91.5	72.7	11.1	28.90	1.007	0.995	0.977	1.009
4	2,100	10.0	123.4	600	2,102	126.0	31.6	73.0	11.4	28.91	1.012	0.992	0.981	1.010
5	1,500	100.0	1,738.0	600	1,501	1,738.0	149.2	72.5	11.1	28.91	1.008	0.994	0.973	1.009
6	1,500	75.0	1,303.5	600	1,499	1,303.0	126.0	72.8	11.0	28.92	1.005	0.996	0.974	1.009
7	1,500	50.0	869.0	600	1,502	866.0	88.4	73.0	10.8	28.93	1.001	0.999	0.977	1.009
8	900	0.0	0.0	900	902	-1.0	3.9	74.0	11.3	28.94	1.012	0.992	0.983	1.012

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	492.9	57.94	0.00	57.94	122.8	2,246.7	17.32	238,317
2	372.4	75.60	0.00	75.60	113.2	1,535.0	29.34	180,931
3	247.3	83.14	0.00	83.14	129.9	667.8	41.77	131,467
4	50.2	102.64	1.65	101.00	296.3	162.0	45.29	44,739
5	463.1	30.65	0.91	29.75	84.5	2,332.8	11.47	214,992
6	371.3	37.03	0.00	37.03	106.7	1,371.2	16.59	181,467
7	247.3	40.85	1.04	39.81	101.9	772.5	21.23	127,226
8	0.0	32.79	1.00	31.78	39.5	37.6	5.86	5,417

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	73.9	8.69	0.00	8.69	18.42	337.01	2.60	35,748
2	.150	55.9	11.34	0.00	11.34	16.98	230.25	4.40	27,140
3	.150	37.1	12.47	0.00	12.47	19.48	100.17	6.27	19,720
4	.100	5.0	10.26	0.16	10.10	29.63	16.20	4.53	4,474
5	.100	46.3	3.07	0.09	2.97	8.45	233.28	1.15	21,499
6	.100	37.1	3.70	0.00	3.70	10.67	137.12	1.66	18,147
7	.100	24.7	4.09	0.10	3.98	10.19	77.25	2.12	12,723
8	.150	0.0	4.92	0.15	4.77	5.92	5.64	0.88	813
Total		280.1	58.54	0.51	58.03	119.75	1,136.93	23.60	140,262

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL//RUN 222

Test No.: 12549708M3-COR
 Date: 02/24/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.03	0.00	0.03	0.07	1.20	0.009	128
2	0.04	0.00	0.04	0.06	0.82	0.016	97
3	0.04	0.00	0.04	0.07	0.36	0.022	70
4	0.04	0.00	0.04	0.11	0.06	0.016	16
5	0.01	0.00	0.01	0.03	0.83	0.004	77
6	0.01	0.00	0.01	0.04	0.49	0.006	65
7	0.01	0.00	0.01	0.04	0.28	0.008	45
8	0.02	0.00	0.02	0.02	0.02	0.003	3

Composite Results

BSHC	=	0.21 g/hp-hr	=	0.28 g/kW-hr
BSCO	=	0.43 g/hp-hr	=	0.57 g/kW-hr
BSNOx	=	4.06 g/hp-hr	=	5.44 g/kW-hr
Particulate	=	0.084 g/hp-hr	=	0.113 g/kW-hr
BSCO2	=	501 g/hp-hr	=	672 g/kW-hr
BSFC	=	0.348 lb/hp-hr	=	0.212 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.21 g/hp-hr	=	0.28 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL/RUN 222

Test No.: 12549708M3-COR
 Date: 02/24/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	97.9 (28.90)	97.8 (28.89)	97.9 (28.90)	97.9 (28.91)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 10.1	26.1 (79.0) / 9.6	26.7 (80.0) / 10.1	26.7 (80.0) / 10.1
Engine Air Dew Pt., °C (°F)	14.2 (57.6)	14.9 (58.8)	15.1 (59.1)	15.4 (59.7)
Engine Air Temp, °C (°F)	22.3 (72.2)	22.4 (72.4)	22.6 (72.7)	22.8 (73.0)
Engine Air: RH,% / AH, g/kg	60 / 10.5	62 / 11.0	62 / 11.1	63 / 11.4
NOx Humidity C.F.	.997	1.005	1.007	1.012
Dry-to-Wet C.F.	.971	.975	.977	.981
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	147.35 (5,583.8)	150.92 (5,718.9)	151.79 (5,751.9)	158.02 (5,988.0)
90mm Sample Rate, scmm (scfm)*	0.0447 (1.69)	0.0446 (1.69)	0.0438 (1.66)	0.0439 (1.66)
Total Volume, scm (scf)*	2,211.0 (83,782)	2,264.4 (85,808)	2,277.5 (86,303)	1,580.7 (59,897)
HC Sample Meter/Range/ppm	0.0/0/15.0	0.0/0/18.3	0.0/0/18.7	0.0/0/22.8
HC Bckgrd Meter/Range/ppm	5.0/100/5.1	5.2/100/5.3	4.3/100/4.4	5.4/100/5.5
CO Sample Meter/Range/ppm (Dry)	13.1/100/12.5	12.1/100/11.5	14.3/100/13.6	28.9/100/27.9
CO Bckgrd Meter/Range/ppm	1.0/100/0.9	1.3/100/1.2	2.1/100/2.0	2.6/100/2.4
CO2 Sample Meter/Range/% (Wet)	73.3/2/1.4182	57.7/2/1.0735	84.2/1/0.7844	42.0/1/0.2927
CO2 Bckgrd Meter/Range/%	3.1/2/0.0510	3.7/2/0.0609	8.9/1/0.0524	9.1/1/0.0536
NOx Sample Meter/Range/ppm (Dry)	0.0/0/128.2	0.0/0/84.5	0.0/0/36.5	0.0/0/8.6
NOx Bckgrd Meter/Range/ppm	1.0/25/0.3	1.1/25/0.3	0.9/25/0.2	1.0/25/0.3
CH4 Sample Meter/Range/ppm	1.8	2.2	2.0	2.3
CH4 Bckgrd Meter/Range/ppm	2.2	2.4	2.3	2.1
Dilution Factor	9.52	12.57	17.18	45.46
HC Concentration, ppm	10.48	13.46	14.58	17.48
CO Concentration, ppm	11.11	10.00	11.41	25.01
CO2 Concentration, %	1.37	1.02	0.74	0.24
NOx Concentration, ppm	124.22	82.15	35.46	8.23
HC Mass, grams	14.49	18.90	20.78	17.11
CO Mass, grams	30.70	28.30	32.47	49.39
CO2 Mass, grams	59,579.32	45,232.73	32,866.76	7,456.51
NOx Mass, grams	561.69	383.76	166.95	27.01
Part. Mass, grams	4.319	7.362	10.499	7.613
Fuel, kg (lb)	18.765 (41.38)	14.257 (31.44)	10.372 (22.87)	2.386 (5.26)
KW-HR (hp-hr)	91.89 (123.22)	69.42 (93.10)	46.10 (61.82)	6.24 (8.37)
Filter Number	1386	1387	1388	1389
Weight Gain, mg	1.309	2.176	3.029	2.116
Sample Multiplier	3.300	3.383	3.466	3.598
Blower 1, scf	42,899.0	44,045.0	43,915.2	30,918.0
Blower 2, scf	40,857.9	41,737.9	42,363.0	28,962.5
Gas Meter 1, scf	36.816	36.552	36.513	24.357
Gas Meter 2, scf	62.207	61.914	61.412	41.006

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL//RUN 222

Test No.: 12549708M3-COR
 Date: 02/24/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	97.9 (28.91)	97.9 (28.92)	98.0 (28.93)	98.0 (28.94)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.2 (81.0) / 9.9	28.3 (83.0) / 10.1	28.9 (84.0) / 9.9	28.3 (83.0) / 10.1
Engine Air Dew Pt., °C (°F)	15.1 (59.2)	14.9 (58.8)	14.6 (58.3)	15.4 (59.7)
Engine Air Temp, °C (°F)	22.5 (72.5)	22.7 (72.8)	22.8 (73.0)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	63 / 11.1	61 / 11.0	60 / 10.8	61 / 11.3
NOx Humidity C.F.	1.008	1.005	1.001	1.012
Dry-to-Wet C.F.	.973	.974	.977	.983
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	149.27 (5,656.4)	151.46 (5,739.4)	155.50 (5,892.5)	159.60 (6,047.8)
90mm Sample Rate, scmm (scfm)*	0.0455 (1.72)	0.0447 (1.69)	0.0438 (1.66)	0.0443 (1.68)
Total Volume, scm (scf)*	1,493.2 (56,582)	1,515.1 (57,411)	1,555.4 (58,941)	2,394.7 (90,743)
HC Sample Meter/Range/ppm	0.0/0/10.1	0.0/0/11.2	0.0/0/12.0	0.0/0/12.6
HC Bckgrd Meter/Range/ppm	5.0/100/5.1	5.1/100/5.2	5.2/100/5.3	7.0/100/7.1
CO Sample Meter/Range/ppm (Dry)	10.2/100/9.7	12.8/100/12.2	11.9/100/11.3	7.3/100/6.9
CO Bckgrd Meter/Range/ppm	2.1/100/2.0	2.8/100/2.6	2.6/100/2.4	3.8/100/3.6
CO2 Sample Meter/Range/% (Wet)	66.8/2/1.2715	57.6/2/1.0714	81.7/1/0.7468	14.7/1/0.0888
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	3.6/2/0.0593	9.4/1/0.0555	10.2/1/0.0604
NOx Sample Meter/Range/ppm (Dry)	0.0/0/129.6	0.0/0/75.2	0.0/0/41.4	0.0/0/2.2
NOx Bckgrd Meter/Range/ppm	1.0/25/0.3	0.6/25/0.2	0.9/25/0.2	1.2/25/0.3
CH4 Sample Meter/Range/ppm	2.1	1.8	2.1	2.1
CH4 Bckgrd Meter/Range/ppm	2.1	2.1	2.0	2.0
Dilution Factor	10.63	12.60	18.07	149.15
HC Concentration, ppm	5.52	6.45	7.06	5.52
CO Concentration, ppm	7.55	9.39	8.74	3.30
CO2 Concentration, %	1.22	1.02	0.69	0.03
NOx Concentration, ppm	125.87	73.14	40.28	1.89
HC Mass, grams	5.11	6.17	6.81	8.20
CO Mass, grams	14.09	17.78	16.99	9.87
CO2 Mass, grams	35,831.93	30,244.42	21,204.36	1,354.23
NOx Mass, grams	388.80	228.54	128.76	9.39
Part. Mass, grams	1.923	2.774	3.542	1.477
Fuel, kg (lb)	11.280 (24.87)	9.526 (21.00)	6.683 (14.74)	0.439 (0.97)
KW-HR (hp-hr)	57.55 (77.18)	46.15 (61.89)	30.73 (41.21)	0.01 (0.01)
Filter Number	1390	1391	1392	1393
Weight Gain, mg	0.586	0.819	0.998	0.410
Sample Multiplier	3.281	3.387	3.549	3.603
Blower 1, scf	29,043.7	29,649.2	30,690.0	46,461.1
Blower 2, scf	27,520.7	27,744.7	28,234.7	44,256.3
Gas Meter 1, scf	24.377	24.609	24.989	37.396
Gas Meter 2, scf	41.623	41.558	41.598	62.584

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL/RUN 222

Test No.: 12549708M4-COR
 Date: 02/25/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,237.0	900	2,102	1,237.0	146.6	72.4	7.9	29.07	0.952	1.038	0.978	1.001
2	2,100	75.0	927.8	900	2,101	933.0	124.2	72.9	8.0	29.08	0.953	1.037	0.981	1.002
3	2,100	50.0	618.5	900	2,101	628.0	91.5	72.4	8.2	29.08	0.956	1.035	0.984	1.001
4	2,100	10.0	123.7	600	2,101	125.0	31.4	73.0	8.2	29.09	0.957	1.034	0.988	1.002
5	1,500	100.0	1,764.0	600	1,501	1,764.0	163.4	73.0	7.9	29.10	0.951	1.039	0.978	1.002
6	1,500	75.0	1,323.0	600	1,501	1,313.0	126.3	72.6	8.1	29.10	0.954	1.037	0.982	1.001
7	1,500	50.0	882.0	600	1,501	881.0	85.6	72.9	8.2	29.11	0.956	1.034	0.985	1.002
8	900	0.0	0.0	900	902	-1.0	3.6	75.2	8.2	29.11	0.956	1.034	0.990	1.008

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	494.5	61.60	0.14	61.46	115.6	2,227.9	18.38	211,013
2	372.8	76.72	0.00	76.72	109.1	1,520.7	29.74	178,770
3	250.7	85.39	0.00	85.39	128.1	663.9	43.46	131,440
4	49.9	102.83	2.44	100.39	295.8	152.6	49.28	44,540
5	503.4	38.65	0.22	38.43	82.2	2,494.6	13.56	235,446
6	374.4	39.91	0.00	39.91	106.4	1,375.3	15.66	181,801
7	251.5	43.99	0.00	43.99	93.1	776.0	19.73	123,184
8	0.1	36.18	1.03	35.15	37.2	23.7	5.06	5,003

Mode	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	74.2	9.24	0.02	9.22	17.34	334.18	2.76	31,652
2	.150	55.9	11.51	0.00	11.51	16.37	228.10	4.46	26,815
3	.150	37.6	12.81	0.00	12.81	19.22	99.58	6.52	19,716
4	.100	5.0	10.28	0.24	10.04	29.58	15.26	4.93	4,454
5	.100	50.3	3.86	0.02	3.84	8.22	249.46	1.36	23,545
6	.100	37.4	3.99	0.00	3.99	10.64	137.53	1.57	18,180
7	.100	25.2	4.40	0.00	4.40	9.31	77.60	1.97	12,318
8	.150	0.0	5.43	0.15	5.27	5.58	3.56	0.76	750
Total		285.6	61.52	0.44	61.08	116.25	1,145.27	24.32	137,431

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL/RUN 222

Test No.: 12549708M4-COR
 Date: 02/25/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.03	0.00	0.03	0.06	1.17	0.010	111
2	0.04	0.00	0.04	0.06	0.80	0.016	94
3	0.04	0.00	0.04	0.07	0.35	0.023	69
4	0.04	0.00	0.04	0.10	0.05	0.017	16
5	0.01	0.00	0.01	0.03	0.87	0.005	82
6	0.01	0.00	0.01	0.04	0.48	0.005	64
7	0.02	0.00	0.02	0.03	0.27	0.007	43
8	0.02	0.00	0.02	0.02	0.01	0.003	3

Composite Results

BSHC	=	0.22 g/hp-hr	=	0.29 g/kW-hr
BSCO	=	0.41 g/hp-hr	=	0.55 g/kW-hr
BSNOx	=	4.01 g/hp-hr	=	5.38 g/kW-hr
Particulate	=	0.085 g/hp-hr	=	0.114 g/kW-hr
BSCO2	=	481 g/hp-hr	=	645 g/kW-hr
BSFC	=	0.335 lb/hp-hr	=	0.203 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.21 g/hp-hr	=	0.29 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL/RUN 222

Test No.: 12549708M4-COR
 Date: 02/25/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.4 (29.07)	98.5 (29.08)	98.5 (29.08)	98.5 (29.09)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.6 (78.0) / 5.8	27.2 (81.0) / 5.8	27.2 (81.0) / 5.8	27.2 (81.0) / 5.8
Engine Air Dew Pt., °C (°F)	10.1 (50.2)	10.3 (50.5)	10.5 (50.9)	10.7 (51.2)
Engine Air Temp, °C (°F)	22.4 (72.4)	22.7 (72.9)	22.4 (72.4)	22.8 (73.0)
Engine Air: RH,% / AH, g/kg	46 / 7.9	45 / 8.0	47 / 8.2	46 / 8.2
NOx Humidity C.F.	.952	.953	.956	.957
Dry-to-Wet C.F.	.978	.981	.984	.988
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	147.69 (5,596.5)	150.48 (5,702.1)	152.94 (5,795.3)	157.87 (5,982.4)
90mm Sample Rate, scmm (scfm)*	0.0449 (1.70)	0.0446 (1.69)	0.0436 (1.65)	0.0436 (1.65)
Total Volume, scm (scf)*	2,216.0 (83,973)	2,257.8 (85,557)	2,294.7 (86,954)	1,579.2 (59,840)
HC Sample Meter/Range/ppm	0.0/0/15.4	0.0/0/18.3	0.0/0/19.7	0.0/0/21.9
HC Bckgrd Meter/Range/ppm	4.6/100/4.7	4.9/100/5.0	5.0/100/5.1	4.4/100/4.5
CO Sample Meter/Range/ppm (Dry)	13.9/100/13.3	12.5/100/11.9	13.5/100/12.9	29.0/100/28.0
CO Bckgrd Meter/Range/ppm	2.8/100/2.6	2.2/100/2.1	1.6/100/1.5	2.9/100/2.7
CO2 Sample Meter/Range/% (Wet)	74.0/2/1.4343	57.7/2/1.0735	84.1/1/0.7828	42.6/1/0.2979
CO2 Bckgrd Meter/Range/%	4.1/16/0.2481	4.3/2/0.0709	9.6/1/0.0567	10.1/1/0.0598
NOx Sample Meter/Range/ppm (Dry)	0.0/0/132.0	0.0/0/88.1	0.0/0/37.8	0.0/0/8.7
NOx Bckgrd Meter/Range/ppm	1.9/25/0.5	1.8/25/0.5	1.2/25/0.3	1.6/25/0.4
CH4 Sample Meter/Range/ppm	1.9	1.9	1.9	2.4
CH4 Bckgrd Meter/Range/ppm	2.1	2.1	2.2	2.1
Dilution Factor	9.42	12.57	17.22	44.69
HC Concentration, ppm	11.24	13.69	14.91	17.51
CO Concentration, ppm	10.44	9.67	11.17	24.99
CO2 Concentration, %	1.21	1.01	0.73	0.24
NOx Concentration, ppm	128.63	86.04	36.88	8.20
HC Mass, grams	15.40	19.18	21.35	17.14
CO Mass, grams	28.90	27.28	32.03	49.30
CO2 Mass, grams	52,753.28	44,692.40	32,859.96	7,423.38
NOx Mass, grams	556.96	380.17	165.97	25.43
Part. Mass, grams	4.427	7.170	10.495	7.944
Fuel, kg (lb)	16.618 (36.64)	14.087 (31.06)	10.370 (22.87)	2.376 (5.24)
KW-HR (hp-hr)	92.18 (123.62)	69.50 (93.20)	46.74 (62.68)	6.20 (8.31)
Filter Number	1405	1406	1407	1408
Weight Gain, mg	1.346	2.124	2.989	2.192
Sample Multiplier	3.289	3.376	3.511	3.624
Blower 1, scf	43,002.7	43,686.1	44,436.9	30,658.1
Blower 2, scf	40,944.4	41,845.7	42,492.8	29,165.9
Gas Meter 1, scf	37.285	37.229	37.245	24.818
Gas Meter 2, scf	62.819	62.572	62.010	41.330

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 BASE FUEL/RUN 222

Test No.: 12549708M4-COR
 Date: 02/25/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 SECOND PAIR OF TESTS

DIESEL 2D, EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0.000 X= 0.000
 W/ TEMP. CONTROL

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.5 (29.10)	98.5 (29.10)	98.6 (29.11)	98.6 (29.11)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.8 (82.0) / 5.5	28.3 (83.0) / 5.3	28.9 (84.0) / 5.0	28.3 (83.0) / 5.9
Engine Air Dew Pt., °C (°F)	10.0 (50.0)	10.3 (50.6)	10.6 (51.1)	10.6 (51.1)
Engine Air Temp, °C (°F)	22.8 (73.0)	22.6 (72.6)	22.7 (72.9)	24.0 (75.2)
Engine Air: RH,% / AH, g/kg	44 / 7.9	46 / 8.1	46 / 8.2	43 / 8.2
NOx Humidity C.F.	.951	.954	.956	.956
Dry-to-Wet C.F.	.978	.982	.985	.990
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	149.02 (5,647.1)	150.56 (5,705.2)	153.55 (5,818.5)	160.06 (6,065.1)
90mm Sample Rate, scmm (scfm)*	0.0451 (1.71)	0.0452 (1.71)	0.0449 (1.70)	0.0453 (1.72)
Total Volume, scm (scf)*	1,490.7 (56,488)	1,506.0 (57,069)	1,535.9 (58,202)	2,401.5 (91,002)
HC Sample Meter/Range/ppm	0.0/0/10.5	0.0/0/11.2	0.0/0/11.5	0.0/0/9.7
HC Bckgrd Meter/Range/ppm	3.9/100/4.0	4.5/100/4.6	4.0/100/4.1	3.6/100/3.7
CO Sample Meter/Range/ppm (Dry)	10.3/100/9.8	12.5/100/11.9	10.4/100/9.9	5.3/100/5.0
CO Bckgrd Meter/Range/ppm	2.5/100/2.4	2.5/100/2.4	1.8/100/1.7	2.0/100/1.9
CO2 Sample Meter/Range/% (Wet)	72.5/2/1.3999	58.4/2/1.0884	80.7/1/0.7322	13.4/1/0.0805
CO2 Bckgrd Meter/Range/%	4.0/2/0.0659	4.2/2/0.0692	9.2/1/0.0543	9.2/1/0.0543
NOx Sample Meter/Range/ppm (Dry)	0.0/0/146.6	0.0/0/79.7	0.0/0/44.0	0.0/0/1.6
NOx Bckgrd Meter/Range/ppm	2.1/25/0.5	2.1/25/0.5	1.7/25/0.4	1.3/25/0.3
CH4 Sample Meter/Range/ppm	2.1	1.9	1.9	2.2
CH4 Bckgrd Meter/Range/ppm	2.3	2.2	2.1	2.1
Dilution Factor	9.65	12.41	18.43	165.11
HC Concentration, ppm	6.99	7.05	7.67	6.07
CO Concentration, ppm	7.35	9.42	8.09	3.10
CO2 Concentration, %	1.34	1.02	0.68	0.03
NOx Concentration, ppm	142.91	77.74	42.90	1.26
HC Mass, grams	6.44	6.65	7.33	9.04
CO Mass, grams	13.70	17.73	15.52	9.30
CO2 Mass, grams	39,241.00	30,300.18	20,530.63	1,250.79
NOx Mass, grams	415.77	229.22	129.33	5.93
Part. Mass, grams	2.175	2.518	3.179	1.223
Fuel, kg (lb)	12.353 (27.24)	9.544 (21.04)	6.471 (14.27)	0.407 (0.90)
KW-HR (hp-hr)	62.56 (83.90)	46.53 (62.40)	31.26 (41.92)	0.02 (0.03)
Filter Number	1409	1410	1411	1489
Weight Gain, mg	0.658	0.755	0.929	0.346
Sample Multiplier	3.306	3.335	3.422	3.535
Blower 1, scf	28,960.5	29,232.6	29,766.0	46,523.7
Blower 2, scf	27,510.2	27,819.6	28,419.3	44,452.9
Gas Meter 1, scf	24.819	24.804	24.775	37.243
Gas Meter 2, scf	41.906	41.917	41.786	62.986

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN 182

Test No.: 12549328M1-COR
 Date: 02/05/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,164.4	900	2,100	1,164.4	159.3	72.0	9.1	29.00	0.971	1.022	0.976	1.003
2	2,100	75.0	873.3	900	2,101	880.9	121.3	72.0	9.5	29.09	0.978	1.016	0.979	1.001
3	2,100	50.0	582.2	900	2,103	588.9	90.0	72.3	9.7	29.03	0.982	1.013	0.984	1.004
4	2,100	10.0	116.4	600	2,101	118.8	31.3	72.0	9.9	29.03	0.986	1.011	0.985	1.003
5	1,500	100.0	1,677.1	600	1,501	1,677.1	157.7	72.0	9.5	29.03	0.979	1.016	0.976	1.002
6	1,500	75.0	1,257.8	600	1,501	1,268.4	121.9	72.3	9.8	29.03	0.984	1.012	0.979	1.004
7	1,500	50.0	838.5	600	1,499	842.0	87.0	73.0	10.1	29.04	0.989	1.008	0.981	1.006
8	900	0.0	0.0	900	902	4.7	4.3	74.0	10.4	29.04	0.994	1.005	0.988	1.009

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	465.2	75.44	0.00	75.44	85.8	1,988.0	14.34	223,071
2	352.0	90.53	0.00	90.53	98.0	1,365.0	28.64	169,736
3	235.5	92.27	0.55	91.71	117.4	594.0	35.41	125,780
4	47.5	100.65	1.62	99.03	249.9	133.8	37.95	43,232
5	478.4	38.15	0.00	38.15	69.0	2,216.9	11.61	220,963
6	362.0	44.80	0.00	44.80	66.8	1,340.1	14.10	170,696
7	240.0	43.77	0.00	43.77	80.3	711.4	15.71	121,783
8	0.8	32.63	0.00	32.63	41.7	28.0	5.18	5,847

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
2	.150	52.8	13.58	0.00	13.58	14.70	204.75	4.30	25,460
3	.150	35.3	13.84	0.08	13.76	17.62	89.10	5.31	18,867
4	.100	4.7	10.06	0.16	9.90	24.99	13.38	3.80	4,323
5	.100	47.8	3.81	0.00	3.81	6.90	221.69	1.16	22,096
6	.100	36.2	4.48	0.00	4.48	6.68	134.01	1.41	17,070
7	.100	24.0	4.38	0.00	4.38	8.03	71.14	1.57	12,178
8	.150	0.1	4.89	0.00	4.89	6.25	4.20	0.78	877
1	.150	69.8	11.32	0.00	11.32	12.86	298.20	2.15	33,461
Total		270.7	66.37	0.25	66.12	98.03	1,036.46	20.47	134,332

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN 182

Test No.: 12549328M1-COR
 Date: 02/05/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.04	0.00	0.04	0.05	1.10	0.008	124
2	0.05	0.00	0.05	0.05	0.76	0.016	94
3	0.05	0.00	0.05	0.07	0.33	0.020	70
4	0.04	0.00	0.04	0.09	0.05	0.014	16
5	0.01	0.00	0.01	0.03	0.82	0.004	82
6	0.02	0.00	0.02	0.02	0.50	0.005	63
7	0.02	0.00	0.02	0.03	0.26	0.006	45
8	0.02	0.00	0.02	0.02	0.02	0.003	3

Composite Results

BSHC	=	0.25 g/hp-hr	=	0.33 g/kW-hr
BSCO	=	0.36 g/hp-hr	=	0.49 g/kW-hr
BSNOx	=	3.83 g/hp-hr	=	5.13 g/kW-hr
Particulate	=	0.076 g/hp-hr	=	0.101 g/kW-hr
BSCO2	=	496 g/hp-hr	=	666 g/kW-hr
BSFC	=	0.355 lb/hp-hr	=	0.216 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.24 g/hp-hr	=	0.33 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN 182

Test No.: 12549328M1-COR
 Date: 02/05/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.2 (29.00)	98.5 (29.09)	98.3 (29.03)	98.3 (29.03)
Dil. Air: Temp, °C (°F) / AH, g/kg	23.3 (74.0) / 7.4	24.4 (76.0) / 7.6	30.6 (87.0) / 5.6	25.6 (78.0) / 7.8
Engine Air Dew Pt., °C (°F)	12.1 (53.7)	12.8 (55.0)	13.1 (55.6)	13.4 (56.1)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.4 (72.3)	22.2 (72.0)
Engine Air: RH,% / AH, g/kg	53 / 9.1	55 / 9.5	56 / 9.7	57 / 9.9
NOx Humidity C.F.	.971	.978	.982	.986
Dry-to-Wet C.F.	.976	.979	.984	.985
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	149.05 (5,648.0)	153.24 (5,806.9)	154.84 (5,867.5)	158.64 (6,011.5)
90mm Sample Rate, scmm (scfm)*	0.0451 (1.71)	0.0449 (1.70)	0.0443 (1.68)	0.0442 (1.68)
Total Volume, scm (scf)*	2,236.4 (84,745)	2,299.3 (87,129)	2,323.3 (88,038)	1,586.9 (60,132)
HC Sample Meter/Range/ppm	0.0/0/17.2	0.0/0/19.6	0.0/0/20.0	0.0/0/21.3
HC Bckgrd Meter/Range/ppm	3.9/100/4.0	4.1/100/4.2	4.1/100/4.2	4.3/100/4.4
CO Sample Meter/Range/ppm (Dry)	9.6/100/9.1	10.3/100/9.8	11.8/100/11.2	22.8/100/21.9
CO Bckgrd Meter/Range/ppm	1.3/100/1.2	1.1/100/1.0	1.0/100/0.9	0.6/100/0.6
CO2 Sample Meter/Range/% (Wet)	69.0/2/1.3206	53.9/2/0.9934	81.2/1/0.7395	40.7/1/0.2814
CO2 Bckgrd Meter/Range/%	3.4/2/0.0559	3.5/2/0.0576	9.0/1/0.0530	8.7/1/0.0512
NOx Sample Meter/Range/ppm (Dry)	0.0/0/114.6	0.0/0/75.9	0.0/0/32.6	0.0/0/7.3
NOx Bckgrd Meter/Range/ppm	1.6/25/0.4	1.5/25/0.4	1.5/25/0.4	0.9/25/0.2
CH4 Sample Meter/Range/ppm	1.9	1.9	2.1	2.3
CH4 Bckgrd Meter/Range/ppm	2.2	2.2	2.1	2.1
Dilution Factor	10.27	13.64	18.30	47.56
HC Concentration, ppm	13.60	15.77	16.05	17.06
CO Concentration, ppm	7.67	8.53	10.12	21.01
CO2 Concentration, %	1.27	0.94	0.69	0.23
NOx Concentration, ppm	111.50	73.91	31.70	6.95
HC Mass, grams	18.86	22.63	23.07	16.77
CO Mass, grams	21.44	24.50	29.36	41.65
CO2 Mass, grams	55,767.67	42,433.99	31,444.95	7,205.30
NOx Mass, grams	497.00	341.24	148.49	22.30
Part. Mass, grams	3.508	7.045	8.736	6.258
Fuel, kg (lb)	18.065 (39.83)	13.758 (30.34)	10.207 (22.51)	2.368 (5.22)
KW-HR (hp-hr)	86.72 (116.29)	65.62 (88.00)	43.91 (58.88)	5.90 (7.91)
Filter Number	9779	9780	9781	9782
Weight Gain, mg	1.062	2.065	2.498	1.744
Sample Multiplier	3.303	3.412	3.497	3.588
Blower 1, scf	43,276.9	44,467.4	44,907.0	30,660.8
Blower 2, scf	41,442.8	42,635.8	43,105.5	29,454.6
Gas Meter 1, scf	37.350	37.421	37.272	24.842
Gas Meter 2, scf	63.007	62.959	62.445	41.600

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN 182

Test No.: 12549328M1-COR
 Date: 02/05/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.3 (29.03)	98.3 (29.03)	98.3 (29.04)	98.3 (29.04)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.7 (80.0) / 7.3	27.2 (81.0) / 7.7	27.8 (82.0) / 7.5	27.2 (81.0) / 7.1
Engine Air Dew Pt., °C (°F)	12.8 (55.0)	13.3 (55.9)	13.7 (56.7)	14.1 (57.3)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.4 (72.3)	22.8 (73.0)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	55 / 9.5	56 / 9.8	57 / 10.1	56 / 10.4
NOx Humidity C.F.	.979	.984	.989	.994
Dry-to-Wet C.F.	.976	.979	.981	.988
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	150.39 (5,699.0)	151.61 (5,745.0)	154.18 (5,842.5)	160.44 (6,079.5)
90mm Sample Rate, scmm (scfm)*	0.0453 (1.72)	0.0453 (1.71)	0.0453 (1.72)	0.0455 (1.72)
Total Volume, scm (scf)*	1,504.4 (57,007)	1,516.5 (57,467)	1,542.3 (58,442)	2,407.2 (91,219)
HC Sample Meter/Range/ppm	0.0/0/10.4	0.0/0/11.4	0.0/0/11.3	0.0/0/9.5
HC Bckgrd Meter/Range/ppm	4.2/100/4.3	3.8/100/3.9	3.9/100/4.0	4.0/100/4.1
CO Sample Meter/Range/ppm (Dry)	6.9/100/6.5	6.6/100/6.2	7.8/100/7.4	4.9/100/4.6
CO Bckgrd Meter/Range/ppm	0.2/100/0.2	0.2/100/0.2	0.3/100/0.3	1.2/100/1.1
CO2 Sample Meter/Range/% (Wet)	67.9/2/1.2960	54.2/2/0.9997	79.7/1/0.7177	13.9/1/0.0836
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	2.9/2/0.0477	8.5/1/0.0500	9.0/1/0.0530
NOx Sample Meter/Range/ppm (Dry)	0.0/0/125.5	0.0/0/74.7	0.0/0/38.8	0.0/0/1.8
NOx Bckgrd Meter/Range/ppm	1.0/25/0.3	1.0/25/0.3	1.0/25/0.3	1.3/25/0.3
CH4 Sample Meter/Range/ppm	1.8	1.7	1.9	2.2
CH4 Bckgrd Meter/Range/ppm	2.3	2.0	2.2	2.3
Dilution Factor	10.47	13.57	18.88	159.85
HC Concentration, ppm	6.56	7.80	7.52	5.45
CO Concentration, ppm	6.12	5.88	6.94	3.47
CO2 Concentration, %	1.25	0.96	0.67	0.03
NOx Concentration, ppm	122.27	72.90	37.86	1.42
HC Mass, grams	6.36	7.47	7.29	8.16
CO Mass, grams	11.50	11.14	13.38	10.42
CO2 Mass, grams	36,827.11	28,449.30	20,297.24	1,461.84
NOx Mass, grams	369.48	223.36	118.57	6.99
Part. Mass, grams	1.905	2.322	2.599	1.289
Fuel, kg (lb)	11.922 (26.29)	9.214 (20.32)	6.578 (14.50)	0.486 (1.07)
KW-HR (hp-hr)	59.45 (79.73)	44.99 (60.33)	29.83 (40.00)	0.15 (0.20)
Filter Number	9783	9784	9785	9786
Weight Gain, mg	0.574	0.693	0.764	0.365
Sample Multiplier	3.319	3.351	3.401	3.531
Blower 1, scf	29,080.6	29,307.3	29,805.1	46,545.1
Blower 2, scf	27,909.1	28,142.8	28,619.5	44,648.1
Gas Meter 1, scf	24.783	24.662	24.703	37.100
Gas Meter 2, scf	41.960	41.811	41.886	62.935

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN186

Test No.: 12549328M2-COR
 Date: 02/06/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,165.4	900	2,100	1,165.4	156.4	72.0	8.9	29.36	0.968	1.025	0.980	0.994
2	2,100	75.0	874.1	900	2,101	876.8	119.7	72.0	9.3	29.37	0.974	1.020	0.982	0.994
3	2,100	50.0	582.7	900	2,104	591.0	88.9	72.1	9.0	29.39	0.969	1.024	0.982	0.994
4	2,100	10.0	116.5	600	2,102	120.5	31.5	72.7	9.4	29.39	0.976	1.018	0.989	0.996
5	1,500	100.0	1,674.1	600	1,502	1,674.1	155.1	72.0	8.6	29.40	0.963	1.029	0.979	0.993
6	1,500	75.0	1,255.6	600	1,502	1,246.4	126.5	72.0	8.8	29.40	0.966	1.027	0.982	0.993
7	1,500	50.0	837.0	600	1,501	842.5	86.3	73.0	9.1	29.40	0.971	1.023	0.984	0.996
8	900	0.0	0.0	900	902	2.8	4.4	74.0	9.6	29.40	0.981	1.014	0.992	0.999

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	465.6	76.89	2.68	74.21	81.1	2,048.3	12.26	219,006
2	350.4	87.82	0.00	87.82	93.2	1,392.6	26.19	167,375
3	236.6	89.95	0.00	89.95	117.4	609.4	35.58	124,219
4	48.1	98.53	0.69	97.84	236.1	138.9	36.65	43,476
5	478.0	37.98	0.00	37.98	68.0	2,232.4	11.54	217,311
6	355.9	42.27	1.22	41.04	75.6	1,275.1	13.45	177,213
7	240.4	42.14	0.58	41.56	73.2	719.4	15.38	120,794
8	0.6	31.87	0.00	31.87	41.4	29.2	4.80	5,942

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	69.8	11.53	0.40	11.13	12.17	307.24	1.84	32,851
2	.150	52.6	13.17	0.00	13.17	13.98	208.89	3.93	25,106
3	.150	35.5	13.49	0.00	13.49	17.61	91.40	5.34	18,633
4	.100	4.8	9.85	0.07	9.78	23.61	13.89	3.67	4,348
5	.100	47.8	3.80	0.00	3.80	6.80	223.24	1.15	21,731
6	.100	35.6	4.23	0.12	4.10	7.56	127.51	1.35	17,721
7	.100	24.0	4.21	0.06	4.16	7.32	71.94	1.54	12,079
8	.150	0.1	4.78	0.00	4.78	6.21	4.38	0.72	891
Total		270.1	65.07	0.65	64.42	95.26	1,048.50	19.53	133,361

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN186

Test No.: 12549328M2-COR
 Date: 02/06/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.04	0.00	0.04	0.05	1.14	0.007	122
2	0.05	0.00	0.05	0.05	0.77	0.015	93
3	0.05	0.00	0.05	0.07	0.34	0.020	69
4	0.04	0.00	0.04	0.09	0.05	0.014	16
5	0.01	0.00	0.01	0.03	0.83	0.004	80
6	0.02	0.00	0.02	0.03	0.47	0.005	66
7	0.02	0.00	0.02	0.03	0.27	0.006	45
8	0.02	0.00	0.02	0.02	0.02	0.003	3

Composite Results

BSHC	=	0.24 g/hp-hr	=	0.32 g/kW-hr
BSCO	=	0.35 g/hp-hr	=	0.47 g/kW-hr
BSNOx	=	3.88 g/hp-hr	=	5.21 g/kW-hr
Particulate	=	0.072 g/hp-hr	=	0.097 g/kW-hr
BSCO2	=	494 g/hp-hr	=	662 g/kW-hr
BSFC	=	0.353 lb/hp-hr	=	0.215 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.24 g/hp-hr	=	0.32 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN186

Test No.: 12549328M2-COR
 Date: 02/06/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.4 (29.36)	99.4 (29.37)	99.5 (29.39)	99.5 (29.39)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 5.4	26.1 (79.0) / 5.5	22.2 (72.0) / 7.1	26.7 (80.0) / 5.3
Engine Air Dew Pt., °C (°F)	11.9 (53.5)	12.6 (54.6)	12.1 (53.7)	12.7 (54.9)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.3 (72.1)	22.6 (72.7)
Engine Air: RH,% / AH, g/kg	52 / 8.9	54 / 9.3	52 / 9.0	54 / 9.4
NOx Humidity C.F.	.968	.974	.969	.976
Dry-to-Wet C.F.	.980	.982	.982	.989
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	150.70 (5,710.6)	154.28 (5,846.1)	156.24 (5,920.5)	160.35 (6,076.4)
90mm Sample Rate, scmm (scfm)*	0.0457 (1.73)	0.0458 (1.74)	0.0450 (1.70)	0.0453 (1.72)
Total Volume, scm (scf)*	2,261.2 (85,685)	2,314.9 (87,718)	2,344.3 (88,834)	1,604.0 (60,781)
HC Sample Meter/Range/ppm	0.0/0/17.2	0.0/0/19.1	0.0/0/19.3	0.0/0/20.5
HC Bckgrd Meter/Range/ppm	3.8/100/3.9	4.2/100/4.3	4.0/100/4.1	4.0/100/4.1
CO Sample Meter/Range/ppm (Dry)	8.2/100/7.8	9.1/100/8.6	11.4/100/10.8	21.2/100/20.4
CO Bckgrd Meter/Range/ppm	0.4/100/0.4	0.4/100/0.4	0.6/100/0.6	0.5/100/0.5
CO2 Sample Meter/Range/% (Wet)	67.5/2/1.2870	53.2/2/0.9788	80.2/1/0.7249	40.7/1/0.2814
CO2 Bckgrd Meter/Range/%	3.6/2/0.0593	3.8/2/0.0626	9.0/1/0.0530	8.9/1/0.0524
NOx Sample Meter/Range/ppm (Dry)	0.0/0/116.5	0.0/0/76.8	0.0/0/33.5	0.0/0/7.5
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	0.8/25/0.2	1.1/25/0.3	0.7/25/0.2
CH4 Sample Meter/Range/ppm	2.6	2.1	2.3	2.6
CH4 Bckgrd Meter/Range/ppm	2.4	2.4	2.4	2.6
Dilution Factor	10.54	13.84	18.67	47.60
HC Concentration, ppm	13.69	15.16	15.51	16.55
CO Concentration, ppm	7.18	8.06	10.02	19.64
CO2 Concentration, %	1.23	0.92	0.67	0.23
NOx Concentration, ppm	113.98	75.21	32.68	7.20
HC Mass, grams	19.22	21.96	22.49	16.42
CO Mass, grams	20.28	23.30	29.35	39.35
CO2 Mass, grams	54,751.57	41,843.85	31,054.63	7,246.01
NOx Mass, grams	512.06	348.16	152.34	23.14
Part. Mass, grams	2.991	6.421	8.687	5.999
Fuel, kg (lb)	17.736 (39.11)	13.566 (29.91)	10.080 (22.23)	2.380 (5.25)
KW-HR (hp-hr)	86.80 (116.40)	65.32 (87.60)	44.10 (59.14)	5.98 (8.02)
Filter Number	9886	9887	9888	9889
Weight Gain, mg	0.906	1.906	2.501	1.693
Sample Multiplier	3.301	3.369	3.473	3.543
Blower 1, scf	43,751.1	44,745.5	45,333.8	31,013.6
Blower 2, scf	41,907.9	42,946.6	43,474.1	29,750.2
Gas Meter 1, scf	37.855	37.677	37.683	25.073
Gas Meter 2, scf	63.809	63.716	63.257	42.227

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4932-7.7%ETH/RUN186

Test No.: 12549328M2-COR
 Date: 02/06/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.130 C= 0.844 O= 0.026 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.5 (29.40)	99.5 (29.40)	99.5 (29.40)	99.5 (29.40)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.2 (81.0) / 5.6	27.8 (82.0) / 5.4	26.7 (80.0) / 5.9	26.7 (80.0) / 4.7
Engine Air Dew Pt., °C (°F)	11.4 (52.6)	11.7 (53.1)	12.2 (54.0)	13.2 (55.7)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.8 (73.0)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	50 / 8.6	51 / 8.8	51 / 9.1	53 / 9.6
NOx Humidity C.F.	.963	.966	.971	.981
Dry-to-Wet C.F.	.979	.982	.984	.992
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	151.82 (5,753.0)	153.56 (5,818.8)	156.22 (5,919.6)	162.40 (6,153.8)
90mm Sample Rate, scmm (scfm)*	0.0460 (1.74)	0.0476 (1.80)	0.0458 (1.74)	0.0461 (1.75)
Total Volume, scm (scf)*	1,518.6 (57,547)	1,536.0 (58,206)	1,562.6 (59,214)	2,436.6 (92,333)
HC Sample Meter/Range/ppm	0.0/0/10.5	0.0/0/11.3	0.0/0/11.2	0.0/0/9.3
HC Bckgrd Meter/Range/ppm	4.2/100/4.3	4.2/100/4.3	4.1/100/4.2	4.0/100/4.1
CO Sample Meter/Range/ppm (Dry)	6.8/100/6.4	7.6/100/7.2	7.8/100/7.4	6.0/100/5.7
CO Bckgrd Meter/Range/ppm	0.3/100/0.3	0.5/100/0.5	1.1/100/1.0	2.4/100/2.3
CO2 Sample Meter/Range/% (Wet)	66.8/2/1.2715	53.6/2/0.9872	79.0/1/0.7077	14.2/1/0.0856
CO2 Bckgrd Meter/Range/%	3.8/2/0.0626	3.8/2,500/0.0084	9.2/1/0.0543	9.3/1/0.0549
NOx Sample Meter/Range/ppm (Dry)	0.0/0/126.8	0.0/0/71.3	0.0/0/39.3	0.0/0/1.7
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	0.8/25/0.2	0.8/25/0.2	0.6/25/0.2
CH4 Sample Meter/Range/ppm	2.2	2.6	2.4	2.5
CH4 Bckgrd Meter/Range/ppm	2.5	2.6	2.4	2.5
Dilution Factor	10.67	13.74	19.15	156.02
HC Concentration, ppm	6.65	7.39	7.26	5.28
CO Concentration, ppm	5.97	6.57	6.25	3.40
CO2 Concentration, %	1.21	0.98	0.66	0.03
NOx Concentration, ppm	123.98	69.81	38.52	1.49
HC Mass, grams	6.33	7.04	7.02	7.97
CO Mass, grams	11.33	12.60	12.20	10.36
CO2 Mass, grams	36,218.43	29,535.47	20,132.41	1,485.45
NOx Mass, grams	372.07	212.52	119.91	7.30
Part. Mass, grams	1.869	2.184	2.506	1.183
Fuel, kg (lb)	11.725 (25.85)	9.565 (21.09)	6.524 (14.39)	0.494 (1.09)
KW-HR (hp-hr)	59.40 (79.66)	44.23 (59.32)	29.87 (40.06)	0.10 (0.14)
Filter Number	9890	9891	9892	9893
Weight Gain, mg	0.566	0.676	0.735	0.336
Sample Multiplier	3.301	3.230	3.410	3.521
Blower 1, scf	29,337.2	29,691.8	30,102.9	47,079.4
Blower 2, scf	28,192.5	28,495.8	29,093.5	45,227.4
Gas Meter 1, scf	25.088	24.993	25.063	37.690
Gas Meter 2, scf	42.519	43.012	42.429	63.912

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10% ETH/RUN 163

Test No.: 12549358M2-COR
 Date: 01/29/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,144.0	900	2,101	1,144.0	155.8	72.0	9.2	29.11	0.973	1.020	0.974	1.000
2	2,100	75.0	858.0	900	2,101	866.0	118.9	72.0	9.6	29.11	0.980	1.015	0.977	1.001
3	2,100	50.0	572.0	900	2,101	580.0	87.5	72.0	9.6	29.10	0.981	1.015	0.979	1.001
4	2,100	10.0	114.4	600	2,102	116.0	30.9	72.0	9.6	29.09	0.981	1.014	0.983	1.001
5	1,500	100.0	1,652.0	600	1,501	1,652.0	155.8	72.0	9.6	29.09	0.981	1.014	0.975	1.001
6	1,500	75.0	1,239.0	600	1,500	1,239.0	120.0	72.0	9.8	29.08	0.983	1.012	0.978	1.002
7	1,500	50.0	826.0	600	1,501	825.0	84.6	73.0	9.9	29.07	0.985	1.011	0.980	1.005
8	900	0.0	0.0	900	902	7.0	4.3	74.6	10.0	29.06	0.987	1.009	0.985	1.010

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	457.2	79.92	0.20	79.72	74.5	1,905.8	13.79	217,586
2	346.0	95.92	0.00	95.92	90.3	1,334.2	26.89	165,909
3	231.6	93.03	0.11	92.91	113.0	576.7	31.78	121,951
4	46.6	110.65	1.49	109.16	257.0	132.8	35.53	42,424
5	471.3	42.80	0.00	42.80	59.3	2,190.0	11.47	217,742
6	353.5	43.85	0.00	43.85	68.2	1,283.0	14.83	167,625
7	235.6	41.62	0.00	41.62	72.7	683.6	14.21	118,147
8	1.2	31.44	0.98	30.46	39.5	23.4	5.25	5,835

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
6	.100	35.4	4.39	0.00	4.39	6.82	128.30	1.48	16,762
7	.100	23.6	4.16	0.00	4.16	7.27	68.36	1.42	11,815
8	.150	0.2	4.72	0.15	4.57	5.92	3.51	0.79	875
1	.150	68.6	11.99	0.03	11.96	11.17	285.88	2.07	32,638
2	.150	51.9	14.39	0.00	14.39	13.54	200.13	4.03	24,886
3	.150	34.7	13.95	0.02	13.94	16.96	86.50	4.77	18,293
4	.100	4.7	11.06	0.15	10.92	25.70	13.28	3.55	4,242
5	.100	47.1	4.28	0.00	4.28	5.93	219.00	1.15	21,774
Total		265.9	68.94	0.34	68.59	93.31	1,004.96	19.26	131,286

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10% ETH/RUN 163

Test No.: 12549358M2-COR
 Date: 01/29/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.04	0.04	1.08	0.008	123
2	0.05	0.00	0.05	0.05	0.75	0.015	94
3	0.05	0.00	0.05	0.06	0.33	0.018	69
4	0.04	0.00	0.04	0.10	0.05	0.013	16
5	0.02	0.00	0.02	0.02	0.82	0.004	82
6	0.02	0.00	0.02	0.03	0.48	0.006	63
7	0.02	0.00	0.02	0.03	0.26	0.005	44
8	0.02	0.00	0.02	0.02	0.01	0.003	3

Composite Results

BSHC	=	0.26	g/hp-hr	=	0.35	g/kW-hr
BSCO	=	0.35	g/hp-hr	=	0.47	g/kW-hr
BSNOx	=	3.78	g/hp-hr	=	5.07	g/kW-hr
Particulate	=	0.072	g/hp-hr	=	0.097	g/kW-hr
BSCO2	=	494	g/hp-hr	=	662	g/kW-hr
BSFC	=	0.354	lb/hp-hr	=	0.215	kg/kW-hr
CH4	=	0.00	g/hp-hr	=	0.00	g/kW-hr
NMHC	=	0.26	g/hp-hr	=	0.35	g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10% ETH/RUN 163

Test No.: 12549358M2-COR
 Date: 01/29/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.6 (29.11)	98.6 (29.11)	98.5 (29.10)	98.5 (29.09)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.7 (80.0) / 8.6	26.7 (80.0) / 8.6	27.8 (82.0) / 8.8	27.8 (82.0) / 8.8
Engine Air Dew Pt., °C (°F)	12.3 (54.2)	12.9 (55.3)	13.0 (55.4)	13.0 (55.4)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.2 (72.0)	22.2 (72.0)
Engine Air: RH,% / AH, g/kg	53 / 9.2	56 / 9.6	56 / 9.6	56 / 9.6
NOx Humidity C.F.	.973	.980	.981	.981
Dry-to-Wet C.F.	.974	.977	.979	.983
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	149.07 (5,648.7)	152.31 (5,771.6)	154.18 (5,842.3)	158.04 (5,988.6)
90mm Sample Rate, scmm (scfm)*	0.0452 (1.71)	0.0453 (1.71)	0.0450 (1.70)	0.0447 (1.70)
Total Volume, scm (scf)*	2,236.7 (84,756)	2,285.3 (86,599)	2,313.3 (87,660)	1,580.8 (59,903)
HC Sample Meter/Range/ppm	0.0/0/19.1	0.0/0/21.1	0.0/0/20.3	0.0/0/23.0
HC Bckgrd Meter/Range/ppm	5.1/100/5.2	4.6/100/4.7	4.3/100/4.4	4.3/100/4.4
CO Sample Meter/Range/ppm (Dry)	8.4/100/8.0	9.9/100/9.4	13.0/100/12.4	25.3/100/24.4
CO Bckgrd Meter/Range/ppm	1.2/100/1.1	1.4/100/1.3	2.6/100/2.4	2.5/100/2.4
CO2 Sample Meter/Range/% (Wet)	67.6/2/1.2893	53.3/2/0.9809	80.0/1/0.7220	40.5/1/0.2797
CO2 Bckgrd Meter/Range/%	3.4/2/0.0559	3.7/2/0.0609	9.1/1/0.0536	9.0/1/0.0530
NOx Sample Meter/Range/ppm (Dry)	0.0/0/109.6	0.0/0/74.5	0.0/0/31.9	0.0/0/7.3
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	1.0/25/0.3	1.0/25/0.3	1.0/25/0.3
CH4 Sample Meter/Range/ppm	2.4	2.1	2.1	2.4
CH4 Bckgrd Meter/Range/ppm	2.6	2.4	2.2	2.2
Dilution Factor	10.42	13.68	18.56	47.33
HC Concentration, ppm	14.40	16.75	16.20	18.77
CO Concentration, ppm	6.66	7.91	9.78	21.68
CO2 Concentration, %	1.24	0.92	0.67	0.23
NOx Concentration, ppm	106.63	72.56	30.96	6.96
HC Mass, grams	19.98	23.98	23.26	18.44
CO Mass, grams	18.62	22.57	28.26	42.83
CO2 Mass, grams	54,396.53	41,477.29	30,487.73	7,070.61
NOx Mass, grams	476.46	333.55	144.17	22.14
Part. Mass, grams	3.380	6.622	7.831	5.837
Fuel, kg (lb)	17.663 (38.95)	13.481 (29.73)	9.921 (21.88)	2.332 (5.14)
KW-HR (hp-hr)	85.24 (114.31)	64.50 (86.50)	43.18 (57.90)	5.79 (7.76)
Filter Number	9349	9376	9377	9378
Weight Gain, mg	1.024	1.967	2.284	1.652
Sample Multiplier	3.300	3.367	3.429	3.533
Blower 1, scf	43,286.1	44,333.3	44,718.4	30,544.5
Blower 2, scf	41,443.9	42,240.0	42,916.4	29,342.0
Gas Meter 1, scf	37.278	37.255	37.228	24.804
Gas Meter 2, scf	62.958	62.979	62.794	41.757

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10% ETH/RUN 163

Test No.: 12549358M2-COR
 Date: 01/29/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.5 (29.09)	98.5 (29.08)	98.4 (29.07)	98.4 (29.06)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.2 (81.0) / 8.4	27.8 (82.0) / 8.1	28.3 (83.0) / 8.6	27.8 (82.0) / 8.8
Engine Air Dew Pt., °C (°F)	13.0 (55.4)	13.2 (55.8)	13.3 (56.0)	13.6 (56.4)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.8 (73.0)	23.7 (74.6)
Engine Air: RH,% / AH, g/kg	56 / 9.6	57 / 9.8	55 / 9.9	53 / 10.0
NOx Humidity C.F.	.981	.983	.985	.987
Dry-to-Wet C.F.	.975	.978	.980	.985
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	150.36 (5,697.8)	151.74 (5,750.0)	154.10 (5,839.4)	160.13 (6,068.1)
90mm Sample Rate, scmm (scfm)*	0.0456 (1.73)	0.0454 (1.72)	0.0455 (1.73)	0.0451 (1.71)
Total Volume, scm (scf)*	1,504.1 (56,995)	1,517.8 (57,517)	1,541.5 (58,411)	2,402.7 (91,047)
HC Sample Meter/Range/ppm	0.0/0/11.7	0.0/0/11.3	0.0/0/11.6	0.0/0/10.3
HC Bckgrd Meter/Range/ppm	4.5/100/4.6	4.1/100/4.2	4.6/100/4.7	5.0/100/5.1
CO Sample Meter/Range/ppm (Dry)	7.8/100/7.4	8.3/100/7.9	9.0/100/8.5	6.1/100/5.8
CO Bckgrd Meter/Range/ppm	2.2/100/2.1	1.9/100/1.8	2.3/100/2.2	2.6/100/2.4
CO2 Sample Meter/Range/% (Wet)	67.1/2/1.2781	53.7/2/0.9893	78.4/1/0.6992	13.7/1/0.0824
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	3.4/2/0.0559	8.7/1/0.0512	8.8/1/0.0518
NOx Sample Meter/Range/ppm (Dry)	0.0/0/123.9	0.0/0/71.6	0.0/0/37.7	0.0/0/1.4
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	0.8/25/0.2	1.5/25/0.4	0.8/25/0.2
CH4 Sample Meter/Range/ppm	1.9	1.9	2.1	2.5
CH4 Bckgrd Meter/Range/ppm	2.2	2.4	2.2	2.4
Dilution Factor	10.52	13.58	19.20	160.27
HC Concentration, ppm	7.61	7.46	7.20	5.25
CO Concentration, ppm	5.26	5.99	6.29	3.29
CO2 Concentration, %	1.23	0.94	0.65	0.03
NOx Concentration, ppm	120.56	69.80	36.57	1.20
HC Mass, grams	7.13	7.31	6.94	7.86
CO Mass, grams	9.88	11.36	12.12	9.86
CO2 Mass, grams	36,290.32	27,937.49	19,691.10	1,458.69
NOx Mass, grams	365.01	213.83	113.93	5.86
Part. Mass, grams	1.885	2.441	2.342	1.301
Fuel, kg (lb)	11.776 (25.97)	9.070 (20.00)	6.396 (14.10)	0.486 (1.07)
KW-HR (hp-hr)	58.57 (78.55)	43.94 (58.92)	29.28 (39.26)	0.22 (0.30)
Filter Number	9381	9382	9383	9387
Weight Gain, mg	0.572	0.730	0.692	0.366
Sample Multiplier	3.296	3.344	3.384	3.554
Blower 1, scf	29,066.5	29,329.8	29,783.5	46,442.1
Blower 2, scf	27,911.4	28,169.9	28,610.6	44,579.2
Gas Meter 1, scf	24.855	24.758	24.767	37.129
Gas Meter 2, scf	42.149	41.957	42.027	62.751

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10%ETH/RUN 165

Test No.: 12549358M3-COR
 Date: 01/30/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,143.9	900	2,100	1,143.9	155.9	71.4	9.8	29.15	0.984	1.012	0.975	0.998
2	2,100	75.0	857.9	900	2,101	868.1	119.0	72.0	10.0	29.14	0.987	1.010	0.978	1.000
3	2,100	50.0	572.0	900	2,102	579.8	87.1	72.0	10.1	29.13	0.990	1.008	0.981	1.001
4	2,100	10.0	114.4	600	2,100	117.4	31.9	73.0	10.3	29.12	0.992	1.006	0.984	1.004
5	1,500	100.0	1,648.3	600	1,500	1,648.3	155.3	72.0	10.1	29.12	0.990	1.008	0.975	1.001
6	1,500	75.0	1,236.2	600	1,501	1,239.0	121.0	72.0	10.3	29.13	0.992	1.006	0.978	1.001
7	1,500	50.0	824.2	600	1,501	827.8	84.7	72.0	10.4	29.13	0.994	1.005	0.980	1.001
8	900	0.0	0.0	900	902	4.5	4.5	74.9	10.8	29.14	1.002	0.999	0.987	1.009

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	457.0	85.56	0.00	85.56	75.0	1,938.6	13.29	217,774
2	346.8	95.51	0.34	95.17	86.5	1,349.2	27.09	166,011
3	231.8	93.26	0.00	93.26	124.1	589.7	31.49	121,374
4	46.9	108.68	1.65	107.02	258.6	140.4	34.95	43,876
5	470.2	43.57	0.00	43.57	61.8	2,232.7	11.76	216,998
6	353.5	45.44	0.00	45.44	66.9	1,297.1	14.72	169,105
7	236.2	41.77	0.68	41.08	79.8	702.8	14.74	118,220
8	0.8	34.14	1.09	33.04	43.8	27.0	5.46	6,052

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
2	.150	52.0	14.33	0.05	14.28	12.97	202.38	4.06	24,902
3	.150	34.8	13.99	0.00	13.99	18.62	88.46	4.72	18,206
4	.100	4.7	10.87	0.17	10.70	25.86	14.04	3.49	4,388
5	.100	47.0	4.36	0.00	4.36	6.18	223.27	1.18	21,700
6	.100	35.3	4.54	0.00	4.54	6.69	129.71	1.47	16,910
7	.100	23.6	4.18	0.07	4.11	7.98	70.28	1.47	11,822
8	.150	0.1	5.12	0.16	4.96	6.58	4.05	0.82	908
1	.150	68.5	12.83	0.00	12.83	11.25	290.79	1.99	32,666
Total		266.0	70.22	0.45	69.77	96.12	1,022.98	19.21	131,501

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10%ETH/RUN 165

Test No.: 12549358M3-COR
 Date: 01/30/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.04	1.09	0.007	123
2	0.05	0.00	0.05	0.05	0.76	0.015	94
3	0.05	0.00	0.05	0.07	0.33	0.018	68
4	0.04	0.00	0.04	0.10	0.05	0.013	16
5	0.02	0.00	0.02	0.02	0.84	0.004	82
6	0.02	0.00	0.02	0.03	0.49	0.006	64
7	0.02	0.00	0.02	0.03	0.26	0.006	44
8	0.02	0.00	0.02	0.02	0.02	0.003	3

Composite Results

BSHC	=	0.26 g/hp-hr	=	0.35 g/kW-hr
BSCO	=	0.36 g/hp-hr	=	0.48 g/kW-hr
BSNOx	=	3.85 g/hp-hr	=	5.16 g/kW-hr
Particulate	=	0.072 g/hp-hr	=	0.097 g/kW-hr
BSCO2	=	494 g/hp-hr	=	663 g/kW-hr
BSFC	=	0.354 lb/hp-hr	=	0.216 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.26 g/hp-hr	=	0.35 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10%ETH/RUN 165

Test No.: 12549358M3-COR
 Date: 01/30/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.7 (29.15)	98.7 (29.14)	98.6 (29.13)	98.6 (29.12)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.7 (80.0) / 7.9	27.8 (82.0) / 8.1	28.3 (83.0) / 7.9	27.8 (82.0) / 8.1
Engine Air Dew Pt., °C (°F)	13.3 (56.0)	13.6 (56.4)	13.8 (56.8)	14.0 (57.2)
Engine Air Temp, °C (°F)	21.9 (71.4)	22.2 (72.0)	22.2 (72.0)	22.8 (73.0)
Engine Air: RH,% / AH, g/kg	58 / 9.8	58 / 10.0	59 / 10.1	58 / 10.3
NOx Humidity C.F.	.984	.987	.990	.992
Dry-to-Wet C.F.	.975	.978	.981	.984
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	148.39 (5,623.0)	151.52 (5,741.7)	153.59 (5,820.2)	157.63 (5,973.2)
90mm Sample Rate, scmm (scfm)*	0.0453 (1.72)	0.0450 (1.71)	0.0446 (1.69)	0.0448 (1.70)
Total Volume, scm (scf)*	2,226.5 (84,371)	2,273.5 (86,150)	2,304.6 (87,329)	1,576.7 (59,748)
HC Sample Meter/Range/ppm	0.0/0/19.6	0.0/0/21.6	0.0/0/20.4	0.0/0/23.0
HC Bckgrd Meter/Range/ppm	4.6/100/4.7	5.0/100/5.1	4.4/100/4.5	4.6/100/4.7
CO Sample Meter/Range/ppm (Dry)	9.3/100/8.8	10.6/100/10.1	11.8/100/11.2	23.5/100/22.6
CO Bckgrd Meter/Range/ppm	2.1/100/2.0	2.5/100/2.4	0.2/100/0.2	0.4/100/0.4
CO2 Sample Meter/Range/% (Wet)	67.9/2/1.2960	53.7/2/0.9893	79.3/1/0.7207	40.1/1/0.2873
CO2 Bckgrd Meter/Range/%	3.4/2/0.0559	3.9/2/0.0642	8.3/1/0.0529	8.2/1/0.0522
NOx Sample Meter/Range/ppm (Dry)	0.0/0/110.8	0.0/0/75.3	0.0/0/32.4	0.0/0/7.6
NOx Bckgrd Meter/Range/ppm	1.4/25/0.4	1.7/25/0.4	1.0/25/0.3	0.8/25/0.2
CH4 Sample Meter/Range/ppm	2.4	2.9	2.7	2.5
CH4 Bckgrd Meter/Range/ppm	2.8	3.0	3.0	2.3
Dilution Factor	10.36	13.56	18.60	46.13
HC Concentration, ppm	15.35	16.92	16.17	18.48
CO Concentration, ppm	6.74	7.61	10.78	21.88
CO2 Concentration, %	1.25	0.93	0.67	0.24
NOx Concentration, ppm	107.76	73.25	31.50	7.29
HC Mass, grams	21.39	23.88	23.32	18.11
CO Mass, grams	18.74	21.62	31.04	43.10
CO2 Mass, grams	54,443.51	41,502.68	30,343.42	7,312.71
NOx Mass, grams	484.65	337.30	147.44	23.40
Part. Mass, grams	3.283	6.708	7.812	5.791
Fuel, kg (lb)	17.680 (38.98)	13.489 (29.74)	9.875 (21.78)	2.411 (5.32)
KW-HR (hp-hr)	85.19 (114.24)	64.66 (86.71)	43.21 (57.94)	5.82 (7.81)
Filter Number	9389	9480	9481	9482
Weight Gain, mg	1.002	1.992	2.270	1.644
Sample Multiplier	3.276	3.367	3.441	3.523
Blower 1, scf	43,071.4	43,965.7	44,545.3	30,473.2
Blower 2, scf	41,273.5	42,159.2	42,758.4	29,258.3
Gas Meter 1, scf	37.363	37.179	37.155	24.815
Gas Meter 2, scf	63.115	62.762	62.531	41.776

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4935-10%ETH/RUN 165

Test No.: 12549358M3-COR
 Date: 01/30/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.6 (29.12)	98.6 (29.13)	98.6 (29.13)	98.7 (29.14)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.8 (82.0) / 8.1	27.8 (82.0) / 8.1	28.9 (84.0) / 8.3	28.3 (83.0) / 7.9
Engine Air Dew Pt., °C (°F)	13.8 (56.8)	14.0 (57.2)	14.1 (57.4)	14.8 (58.6)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.2 (72.0)	23.8 (74.9)
Engine Air: RH,% / AH, g/kg	59 / 10.1	60 / 10.3	60 / 10.4	57 / 10.8
NOx Humidity C.F.	.990	.992	.994	1.002
Dry-to-Wet C.F.	.975	.978	.980	.987
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	150.12 (5,688.6)	151.56 (5,743.1)	153.57 (5,819.4)	159.50 (6,044.1)
90mm Sample Rate, scmm (scfm)*	0.0453 (1.72)	0.0455 (1.72)	0.0454 (1.72)	0.0472 (1.79)
Total Volume, scm (scf)*	1,501.6 (56,903)	1,516.0 (57,448)	1,536.2 (58,211)	2,393.2 (90,688)
HC Sample Meter/Range/ppm	0.0/0/11.9	0.0/0/12.2	0.0/0/11.6	0.0/0/10.7
HC Bckgrd Meter/Range/ppm	4.5/100/4.6	4.6/100/4.7	4.5/100/4.6	4.9/100/5.0
CO Sample Meter/Range/ppm (Dry)	6.3/100/6.0	8.0/100/7.6	9.1/100/8.6	6.0/100/5.7
CO Bckgrd Meter/Range/ppm	0.3/100/0.3	1.7/100/1.6	1.7/100/1.6	2.1/100/2.0
CO2 Sample Meter/Range/% (Wet)	67.0/2/1.2759	54.3/2/1.0018	78.1/1/0.7040	14.0/1/0.0905
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	3.6/2/0.0593	8.4/1/0.0535	9.2/1/0.0587
NOx Sample Meter/Range/ppm (Dry)	0.0/0/125.4	0.0/0/71.9	0.0/0/38.3	0.0/0/1.7
NOx Bckgrd Meter/Range/ppm	1.0/25/0.3	1.0/25/0.3	0.8/25/0.2	1.1/25/0.3
CH4 Sample Meter/Range/ppm	2.0	2.0	2.3	2.8
CH4 Bckgrd Meter/Range/ppm	2.3	2.3	2.3	2.7
Dilution Factor	10.54	13.41	19.07	146.13
HC Concentration, ppm	7.72	7.90	7.29	5.72
CO Concentration, ppm	5.49	5.88	6.93	3.67
CO2 Concentration, %	1.23	0.95	0.65	0.03
NOx Concentration, ppm	122.01	70.02	37.39	1.37
HC Mass, grams	7.26	7.57	6.96	8.53
CO Mass, grams	10.29	11.15	13.30	10.96
CO2 Mass, grams	36,166.39	28,184.13	19,703.27	1,513.02
NOx Mass, grams	372.12	216.18	117.13	6.76
Part. Mass, grams	1.944	2.439	2.445	1.366
Fuel, kg (lb)	11.736 (25.88)	9.150 (20.17)	6.401 (14.11)	0.505 (1.11)
KW-HR (hp-hr)	58.43 (78.36)	43.93 (58.91)	29.36 (39.37)	0.15 (0.20)
Filter Number	9483	9484	9485	9486
Weight Gain, mg	0.586	0.732	0.722	0.404
Sample Multiplier	3.318	3.332	3.386	3.382
Blower 1, scf	29,016.2	29,293.2	29,699.1	46,224.8
Blower 2, scf	27,869.6	28,137.8	28,495.1	44,436.5
Gas Meter 1, scf	24.849	24.821	24.771	37.136
Gas Meter 2, scf	42.000	42.064	41.961	63.953

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4950-15%ETH/RUN 172

Test No.: 12549508M1-COR
 Date: 02/02/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,125.5	900	2,102	1,125.5	154.1	72.0	8.4	29.27	0.960	1.032	0.979	0.996
2	2,100	75.0	844.1	900	2,100	849.2	119.1	72.0	8.3	29.27	0.958	1.033	0.988	0.995
3	2,100	50.0	562.8	900	2,101	567.2	86.7	73.0	8.7	29.28	0.965	1.027	0.984	0.998
4	2,100	10.0	112.6	600	2,103	121.7	32.1	72.0	9.1	29.29	0.972	1.022	0.990	0.996
5	1,500	100.0	1,635.3	600	1,500	1,635.3	155.0	72.0	8.4	29.30	0.960	1.032	0.981	0.995
6	1,500	75.0	1,226.5	600	1,501	1,222.9	119.1	72.0	8.6	29.30	0.963	1.029	0.981	0.995
7	1,500	50.0	817.7	600	1,500	822.4	84.2	72.0	8.7	29.31	0.964	1.028	0.985	0.995
8	900	0.0	0.0	900	902	3.1	4.3	74.0	9.2	29.31	0.973	1.021	0.992	1.001

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	449.9	88.65	0.00	88.65	72.1	1,907.0	12.68	212,344
2	339.1	93.72	0.00	93.72	85.0	1,307.5	25.91	164,052
3	226.7	85.96	0.00	85.96	107.7	578.7	28.98	119,266
4	48.7	118.46	2.07	116.39	271.8	150.9	31.15	43,479
5	466.1	38.67	0.00	38.67	48.4	2,199.1	9.87	213,887
6	349.0	43.38	0.00	43.38	63.9	1,253.5	14.18	164,158
7	234.5	40.69	0.00	40.69	80.1	687.8	14.25	116,001
8	0.7	33.08	0.00	33.08	46.5	29.7	5.42	5,719

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	67.5	13.30	0.00	13.30	10.81	286.04	1.90	31,852
2	.150	50.9	14.06	0.00	14.06	12.75	196.13	3.89	24,608
3	.150	34.0	12.89	0.00	12.89	16.16	86.81	4.35	17,890
4	.100	4.9	11.85	0.21	11.64	27.18	15.09	3.11	4,348
5	.100	46.6	3.87	0.00	3.87	4.84	219.91	0.99	21,389
6	.100	34.9	4.34	0.00	4.34	6.39	125.35	1.42	16,416
7	.100	23.5	4.07	0.00	4.07	8.01	68.78	1.42	11,600
8	.150	0.1	4.96	0.00	4.96	6.97	4.46	0.81	858
Total		262.2	69.33	0.21	69.12	93.12	1,002.56	17.89	128,960

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4950-15%ETH/RUN 172

Test No.: 12549508M1-COR
 Date: 02/02/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.05	0.00	0.05	0.04	1.09	0.007	121
2	0.05	0.00	0.05	0.05	0.75	0.015	94
3	0.05	0.00	0.05	0.06	0.33	0.017	68
4	0.05	0.00	0.04	0.10	0.06	0.012	17
5	0.01	0.00	0.01	0.02	0.84	0.004	82
6	0.02	0.00	0.02	0.02	0.48	0.005	63
7	0.02	0.00	0.02	0.03	0.26	0.005	44
8	0.02	0.00	0.02	0.03	0.02	0.003	3

Composite Results

BSHC	=	0.26 g/hp-hr	=	0.35 g/kW-hr
BSCO	=	0.36 g/hp-hr	=	0.48 g/kW-hr
BSNOx	=	3.82 g/hp-hr	=	5.13 g/kW-hr
Particulate	=	0.068 g/hp-hr	=	0.092 g/kW-hr
BSCO2	=	492 g/hp-hr	=	660 g/kW-hr
BSFC	=	0.357 lb/hp-hr	=	0.217 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.26 g/hp-hr	=	0.35 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
Engine Desc.: 12.5 L (763 CID) IL6
Engine Cycle: Diesel
Engine S/N: RG6125HO2204
4950-15%ETH/RUN 172

Test No.: 12549508M1-COR
Date: 02/02/2004 Time:
Program SSDIL: 2.32-R
Cell: 16 Bag Cart: 1
W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
HCR: 1.864 FID Resp: 1.00
H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	99.1 (29.27)	99.1 (29.27)	99.1 (29.28)	99.2 (29.29)
Dil. Air: Temp, °C (°F) / AH, g/kg	26.1 (79.0) / 5.5	27.2 (81.0) / 2.2	27.2 (81.0) / 5.7	27.2 (81.0) / 4.5
Engine Air Dew Pt., °C (°F)	11.1 (51.9)	10.8 (51.5)	11.6 (52.9)	12.3 (54.1)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.8 (73.0)	22.2 (72.0)
Engine Air: RH,% / AH, g/kg	49 / 8.4	48 / 8.3	49 / 8.7	53 / 9.1
NOx Humidity C.F.	.960	.958	.965	.972
Dry-to-Wet C.F.	.979	.988	.984	.990
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	150.35 (5,697.5)	153.60 (5,820.5)	155.34 (5,886.3)	159.44 (6,041.8)
90mm Sample Rate, scmm (scfm)*	0.0454 (1.72)	0.0454 (1.72)	0.0446 (1.69)	0.0451 (1.71)
Total Volume, scm (scf)*	2,256.0 (85,488)	2,304.7 (87,334)	2,330.7 (88,320)	1,594.8 (60,435)
HC Sample Meter/Range/ppm	0.0/0/19.0	0.0/0/20.5	0.0/0/18.9	0.0/0/24.3
HC Bckgrd Meter/Range/ppm	4.1/100/4.2	4.4/100/4.5	4.2/100/4.3	4.4/100/4.5
CO Sample Meter/Range/ppm (Dry)	7.9/100/7.5	8.8/100/8.3	10.8/100/10.3	24.0/100/23.1
CO Bckgrd Meter/Range/ppm	1.0/100/0.9	0.9/100/0.8	0.9/100/0.8	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	65.8/2/1.2493	95.0/1/0.9614	79.0/1/0.7077	41.4/1/0.2875
CO2 Bckgrd Meter/Range/%	3.4/2/0.0559	10.0/1/0.0592	10.0/1/0.0592	9.7/1/0.0573
NOx Sample Meter/Range/ppm (Dry)	0.0/0/109.7	0.0/0/73.5	0.0/0/32.2	0.0/0/8.2
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	1.9/25/0.5	1.6/25/0.4	0.7/25/0.2
CH4 Sample Meter/Range/ppm	1.9	2.5	2.5	2.9
CH4 Bckgrd Meter/Range/ppm	2.8	2.7	2.7	2.6
Dilution Factor	10.83	14.06	19.07	46.38
HC Concentration, ppm	15.24	16.37	14.84	19.94
CO Concentration, ppm	6.39	7.38	9.25	22.74
CO2 Concentration, %	1.20	0.91	0.65	0.23
NOx Concentration, ppm	107.28	72.16	31.34	7.91
HC Mass, grams	22.16	23.43	21.49	19.74
CO Mass, grams	18.01	21.25	26.93	45.31
CO2 Mass, grams	53,085.95	41,012.95	29,816.57	7,246.52
NOx Mass, grams	476.74	326.88	144.68	25.15
Part. Mass, grams	3.072	6.269	7.053	5.081
Fuel, kg (lb)	17.468 (38.52)	13.505 (29.78)	9.829 (21.67)	2.423 (5.34)
KW-HR (hp-hr)	83.87 (112.47)	63.21 (84.77)	42.26 (56.67)	6.05 (8.11)
Filter Number	9488	9535	9536	9537
Weight Gain, mg	0.928	1.854	2.026	1.438
Sample Multiplier	3.311	3.381	3.481	3.534
Blower 1, scf	43,653.6	44,574.5	45,091.0	30,845.5
Blower 2, scf	41,808.5	42,733.4	43,203.9	29,572.1
Gas Meter 1, scf	37.443	37.409	37.386	24.880
Gas Meter 2, scf	63.265	63.237	62.756	41.983

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4950-15%ETH/RUN 172

Test No.: 12549508M1-COR
 Date: 02/02/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	99.2 (29.30)	99.2 (29.30)	99.2 (29.31)	99.2 (29.31)
Dil. Air: Temp, °C (°F) / AH, g/kg	28.3 (83.0) / 4.6	27.8 (82.0) / 6.1	28.3 (83.0) / 5.2	28.3 (83.0) / 4.6
Engine Air Dew Pt., °C (°F)	11.1 (51.9)	11.4 (52.5)	11.5 (52.7)	12.4 (54.3)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.2 (72.0)	23.3 (74.0)
Engine Air: RH,% / AH, g/kg	49 / 8.4	50 / 8.6	51 / 8.7	50 / 9.2
NOx Humidity C.F.	.960	.963	.964	.973
Dry-to-Wet C.F.	.981	.981	.985	.992
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	151.74 (5,750.1)	153.14 (5,802.9)	155.64 (5,897.6)	161.28 (6,111.6)
90mm Sample Rate, scmm (scfm)*	0.0455 (1.72)	0.0453 (1.72)	0.0457 (1.73)	0.0455 (1.72)
Total Volume, scm (scf)*	1,517.9 (57,518)	1,531.8 (58,046)	1,556.8 (58,994)	2,419.9 (91,700)
HC Sample Meter/Range/ppm	0.0/0/10.2	0.0/0/11.3	0.0/0/11.0	0.0/0/9.5
HC Bckgrd Meter/Range/ppm	3.9/100/4.0	4.0/100/4.1	4.2/100/4.3	4.0/100/4.1
CO Sample Meter/Range/ppm (Dry)	5.3/100/5.0	6.8/100/6.4	7.6/100/7.2	4.2/100/4.0
CO Bckgrd Meter/Range/ppm	0.7/100/0.7	0.8/100/0.8	0.2/100/0.2	0.1/100/0.1
CO2 Sample Meter/Range/% (Wet)	65.9/2/1.2515	52.3/2/0.9602	77.2/1/0.6823	13.2/1/0.0792
CO2 Bckgrd Meter/Range/%	3.7/2/0.0609	3.3/2/0.0543	8.9/1/0.0524	8.4/1/0.0494
NOx Sample Meter/Range/ppm (Dry)	0.0/0/125.2	0.0/0/70.5	0.0/0/37.9	0.0/0/1.7
NOx Bckgrd Meter/Range/ppm	0.8/25/0.2	0.6/25/0.2	0.6/25/0.2	0.6/25/0.2
CH4 Sample Meter/Range/ppm	2.2	2.5	2.6	2.7
CH4 Bckgrd Meter/Range/ppm	2.7	2.8	2.8	2.7
Dilution Factor	10.82	14.09	19.81	168.28
HC Concentration, ppm	6.62	7.55	6.95	5.49
CO Concentration, ppm	4.25	5.57	6.87	3.84
CO2 Concentration, %	1.20	0.91	0.63	0.03
NOx Concentration, ppm	122.60	69.02	37.22	1.54
HC Mass, grams	6.44	7.23	6.78	8.27
CO Mass, grams	8.07	10.65	13.36	11.61
CO2 Mass, grams	35,647.79	27,359.68	19,333.48	1,429.74
NOx Mass, grams	366.51	208.91	114.63	7.43
Part. Mass, grams	1.595	2.297	2.310	1.327
Fuel, kg (lb)	11.719 (25.84)	8.999 (19.84)	6.364 (14.03)	0.484 (1.07)
KW-HR (hp-hr)	57.93 (77.69)	43.37 (58.16)	29.15 (39.09)	0.13 (0.18)
Filter Number	9538	9539	9540	9541
Weight Gain, mg	0.478	0.680	0.678	0.374
Sample Multiplier	3.336	3.378	3.407	3.548
Blower 1, scf	29,338.9	29,603.5	30,087.9	46,760.1
Blower 2, scf	28,161.9	28,425.5	28,888.4	44,914.0
Gas Meter 1, scf	24.955	24.848	24.880	37.395
Gas Meter 2, scf	42.196	42.029	42.197	63.239

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4950-15%ETH/RUN 178

Test No.: 12549508M2-COR
 Date: 02/04/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode	Target			Time sec	Measured		C - B Fuel lb/hr	Intake Air			Factors			
	Speed rpm	Load pct	Torque lb-ft		Speed rpm	Torque lb-ft		Temp °F	Humid g/kg	Baro. in-Hg	NOx Hum.	Part. Hum.	Dry Wet	F (TC)
1	2,100	100.0	1,142.9	900	2,100	1,142.9	159.1	72.0	8.5	28.98	0.961	1.031	0.974	1.003
2	2,100	75.0	857.2	900	2,100	857.5	118.5	72.0	8.5	29.00	0.961	1.030	0.976	1.002
3	2,100	50.0	571.5	900	2,101	572.6	87.6	72.0	8.9	28.99	0.968	1.024	0.981	1.003
4	2,100	10.0	114.3	600	2,101	115.4	30.8	73.0	9.0	28.99	0.969	1.024	0.984	1.006
5	1,500	100.0	1,646.7	600	1,502	1,646.7	155.4	72.0	8.7	28.98	0.965	1.027	0.975	1.003
6	1,500	75.0	1,235.0	600	1,500	1,228.3	119.2	72.0	9.2	28.98	0.972	1.021	0.978	1.003
7	1,500	50.0	823.3	600	1,501	822.8	85.4	73.0	9.1	28.98	0.972	1.022	0.981	1.006
8	900	0.0	0.0	900	902	2.3	4.1	74.5	9.1	28.98	0.972	1.022	0.985	1.010

Mode	BHP from Work	Grams/Hour						
		HC	CH4	NMHC	CO	NOx	Part.	CO2
1	456.5	75.53	0.00	75.53	75.5	1,940.7	13.09	219,330
2	342.5	86.90	0.00	86.90	81.7	1,315.4	25.47	163,219
3	228.8	84.21	0.24	83.97	110.6	581.0	29.88	120,509
4	46.1	120.71	1.75	118.96	283.9	151.2	34.56	41,716
5	470.2	36.62	0.00	36.62	51.7	2,202.6	11.33	214,343
6	350.3	40.72	0.00	40.72	60.8	1,282.9	14.22	164,369
7	234.7	38.89	0.47	38.41	78.0	702.5	14.47	117,708
8	0.6	32.82	0.44	32.38	43.4	37.1	5.53	5,532

Mode	Weighted Results								
	Mode wf	Power bhp	Grams/Hour						
			HC	CH4	NMHC	CO	NOx	Part.	CO2
1	.150	68.5	11.33	0.00	11.33	11.33	291.11	1.96	32,899
2	.150	51.4	13.04	0.00	13.04	12.25	197.31	3.82	24,483
3	.150	34.3	12.63	0.04	12.60	16.59	87.14	4.48	18,076
4	.100	4.6	12.07	0.18	11.90	28.39	15.12	3.46	4,172
5	.100	47.0	3.66	0.00	3.66	5.17	220.26	1.13	21,434
6	.100	35.0	4.07	0.00	4.07	6.08	128.29	1.42	16,437
7	.100	23.5	3.89	0.05	3.84	7.80	70.25	1.45	11,771
8	.150	0.1	4.92	0.07	4.86	6.51	5.57	0.83	830
Total		264.3	65.61	0.32	65.29	94.12	1,015.06	18.55	130,102

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4950-15%ETH/RUN 178

Test No.: 12549508M2-COR
 Date: 02/04/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode	Weighted Modal Contribution						
	g/hp-hr						
	HC	CH4	NMHC	CO	NOx	Part.	CO2
1	0.04	0.00	0.04	0.04	1.10	0.007	124
2	0.05	0.00	0.05	0.05	0.75	0.014	93
3	0.05	0.00	0.05	0.06	0.33	0.017	68
4	0.05	0.00	0.05	0.11	0.06	0.013	16
5	0.01	0.00	0.01	0.02	0.83	0.004	81
6	0.02	0.00	0.02	0.02	0.49	0.005	62
7	0.01	0.00	0.01	0.03	0.27	0.005	45
8	0.02	0.00	0.02	0.02	0.02	0.003	3

Composite Results

BSHC	=	0.25 g/hp-hr	=	0.33 g/kW-hr
BSCO	=	0.36 g/hp-hr	=	0.48 g/kW-hr
BSNOx	=	3.84 g/hp-hr	=	5.15 g/kW-hr
Particulate	=	0.070 g/hp-hr	=	0.094 g/kW-hr
BSCO2	=	492 g/hp-hr	=	660 g/kW-hr
BSFC	=	0.357 lb/hp-hr	=	0.217 kg/kW-hr
CH4	=	0.00 g/hp-hr	=	0.00 g/kW-hr
NMHC	=	0.25 g/hp-hr	=	0.33 g/kW-hr

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4950-15%ETH/RUN 178

Test No.: 12549508M2-COR
 Date: 02/04/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode Number	1	2	3	4
Barometer, kPa (in Hg)	98.1 (28.98)	98.2 (29.00)	98.2 (28.99)	98.2 (28.99)
Dil. Air: Temp, °C (°F) / AH, g/kg	25.0 (77.0) / 8.7	25.0 (77.0) / 9.4	26.7 (80.0) / 8.0	27.2 (81.0) / 8.4
Engine Air Dew Pt., °C (°F)	11.0 (51.8)	11.1 (51.9)	11.8 (53.2)	11.9 (53.4)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.2 (72.0)	22.8 (73.0)
Engine Air: RH, % / AH, g/kg	49 / 8.5	49 / 8.5	52 / 8.9	50 / 9.0
NOx Humidity C.F.	.961	.961	.968	.969
Dry-to-Wet C.F.	.974	.976	.981	.984
Time, seconds	900.0	900.0	900.0	600.0
Tot. Blower Rate, scmm (scfm)*	147.69 (5,596.4)	151.21 (5,729.9)	153.93 (5,833.1)	157.84 (5,981.2)
90mm Sample Rate, scmm (scfm)*	0.0450 (1.71)	0.0451 (1.71)	0.0448 (1.70)	0.0444 (1.68)
Total Volume, scm (scf)*	2,216.0 (83,971)	2,268.8 (85,974)	2,309.7 (87,522)	1,578.9 (59,829)
HC Sample Meter/Range/ppm	0.0/0/17.4	0.0/0/19.3	0.0/0/18.6	0.0/0/24.8
HC Bckgrd Meter/Range/ppm	4.1/100/4.2	4.2/100/4.3	4.1/100/4.2	4.3/100/4.4
CO Sample Meter/Range/ppm (Dry)	8.5/100/8.1	8.8/100/8.3	11.1/100/10.6	27.1/100/26.2
CO Bckgrd Meter/Range/ppm	1.1/100/1.0	1.0/100/0.9	0.8/100/0.8	1.9/100/1.8
CO2 Sample Meter/Range/% (Wet)	68.5/2/1.3094	95.0/1/0.9614	79.0/1/0.7077	39.6/1/0.2721
CO2 Bckgrd Meter/Range/%	3.3/2/0.0543	8.3/1/0.0488	7.8/1/0.0457	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/114.1	0.0/0/75.5	0.0/0/32.4	0.0/0/8.4
NOx Bckgrd Meter/Range/ppm	0.5/25/0.1	0.7/25/0.2	0.5/25/0.1	1.0/25/0.3
CH4 Sample Meter/Range/ppm	1.9	2.0	2.0	2.4
CH4 Bckgrd Meter/Range/ppm	2.2	2.3	2.1	2.2
Dilution Factor	10.33	14.06	19.07	48.90
HC Concentration, ppm	13.66	15.31	14.71	20.53
CO Concentration, ppm	6.82	7.20	9.58	23.98
CO2 Concentration, %	1.26	0.92	0.66	0.22
NOx Concentration, ppm	111.05	73.48	31.64	8.02
HC Mass, grams	18.88	21.73	21.05	20.12
CO Mass, grams	18.88	20.41	27.65	47.31
CO2 Mass, grams	54,832.49	40,804.71	30,127.28	6,952.67
NOx Mass, grams	485.18	328.86	145.24	25.21
Part. Mass, grams	3.175	6.180	7.292	5.627
Fuel, kg (lb)	18.039 (39.78)	13.435 (29.62)	9.931 (21.90)	2.328 (5.13)
KW-HR (hp-hr)	85.11 (114.13)	63.85 (85.62)	42.65 (57.20)	5.73 (7.68)
Filter Number	9714	9715	9716	9717
Weight Gain, mg	0.967	1.842	2.122	1.581
Sample Multiplier	3.283	3.355	3.436	3.559
Blower 1, scf	42,872.8	43,894.3	44,638.9	30,504.2
Blower 2, scf	41,073.0	42,054.2	42,858.1	29,308.1
Gas Meter 1, scf	37.139	37.019	37.040	24.708
Gas Meter 2, scf	62.717	62.643	62.510	41.518

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research

Part 89, 8-mode Emission Test Results

Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
 4950-15%ETH/RUN 178

Test No.: 12549508M2-COR
 Date: 02/04/2004 Time:
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
 W/ TEMP. CONTROL

DIESEL 2D, EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.130 C= 0.831 O= 0.039 X= 0.000

Mode Number	5	6	7	8
Barometer, kPa (in Hg)	98.1 (28.98)	98.1 (28.98)	98.1 (28.98)	98.1 (28.98)
Dil. Air: Temp, °C (°F) / AH, g/kg	27.8 (82.0) / 8.2	27.8 (82.0) / 8.2	28.3 (83.0) / 7.9	27.8 (82.0) / 8.9
Engine Air Dew Pt., °C (°F)	11.4 (52.6)	12.2 (53.9)	12.1 (53.8)	12.1 (53.8)
Engine Air Temp, °C (°F)	22.2 (72.0)	22.2 (72.0)	22.8 (73.0)	23.6 (74.5)
Engine Air: RH,% / AH, g/kg	50 / 8.7	53 / 9.2	51 / 9.1	48 / 9.1
NOx Humidity C.F.	.965	.972	.972	.972
Dry-to-Wet C.F.	.975	.978	.981	.985
Time, seconds	600.0	600.0	600.0	900.0
Tot. Blower Rate, scmm (scfm)*	150.10 (5,687.8)	151.61 (5,745.0)	154.06 (5,837.7)	159.76 (6,053.9)
90mm Sample Rate, scmm (scfm)*	0.0453 (1.72)	0.0453 (1.72)	0.0452 (1.71)	0.0451 (1.71)
Total Volume, scm (scf)*	1,501.4 (56,895)	1,516.5 (57,467)	1,541.0 (58,395)	2,397.1 (90,835)
HC Sample Meter/Range/ppm	0.0/0/10.3	0.0/0/11.0	0.0/0/10.8	0.0/0/9.7
HC Bckgrd Meter/Range/ppm	4.1/100/4.2	4.2/100/4.3	4.2/100/4.3	4.2/100/4.3
CO Sample Meter/Range/ppm (Dry)	5.6/100/5.3	6.5/100/6.1	7.6/100/7.2	4.6/100/4.3
CO Bckgrd Meter/Range/ppm	0.6/100/0.6	0.7/100/0.7	0.3/100/0.3	0.7/100/0.7
CO2 Sample Meter/Range/% (Wet)	66.4/2/1.2626	52.8/2/0.9705	78.0/1/0.6935	13.0/1/0.0779
CO2 Bckgrd Meter/Range/%	3.4/2/0.0559	3.3/2/0.0543	8.1/1/0.0475	8.3/1/0.0488
NOx Sample Meter/Range/ppm (Dry)	0.0/0/126.9	0.0/0/72.5	0.0/0/39.0	0.0/0/2.2
NOx Bckgrd Meter/Range/ppm	1.1/25/0.3	0.9/25/0.2	0.7/25/0.2	1.0/25/0.3
CH4 Sample Meter/Range/ppm	1.9	1.9	2.2	2.2
CH4 Bckgrd Meter/Range/ppm	2.2	2.2	2.3	2.2
Dilution Factor	10.72	13.94	19.49	170.92
HC Concentration, ppm	6.51	7.08	6.78	5.51
CO Concentration, ppm	4.59	5.35	6.76	3.62
CO2 Concentration, %	1.21	0.92	0.65	0.03
NOx Concentration, ppm	123.45	70.65	38.09	1.94
HC Mass, grams	6.10	6.79	6.48	8.20
CO Mass, grams	8.61	10.14	13.01	10.85
CO2 Mass, grams	35,723.76	27,394.76	19,617.96	1,382.93
NOx Mass, grams	367.10	213.82	117.08	9.28
Part. Mass, grams	1.838	2.321	2.360	1.354
Fuel, kg (lb)	11.744 (25.90)	9.010 (19.87)	6.457 (14.24)	0.468 (1.03)
KW-HR (hp-hr)	58.44 (78.37)	43.54 (58.39)	29.16 (39.11)	0.11 (0.15)
Filter Number	9718	9719	9766	9767
Weight Gain, mg	0.555	0.694	0.693	0.382
Sample Multiplier	3.312	3.345	3.406	3.543
Blower 1, scf	28,996.5	29,289.8	29,813.8	46,267.2
Blower 2, scf	27,881.1	28,160.4	28,563.7	44,542.0
Gas Meter 1, scf	24.733	24.672	24.686	37.066
Gas Meter 2, scf	41.912	41.852	41.832	62.702

* scf at 68°F and scm at 0°C

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
4932-7.7%ETH/RUN 182

Test No.: 12549328M1-COR
 Date: 2/5
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
W/ TEMP. CONTROL

Time: DIESEL 2D EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.13 C= 0.844 O= 0.026 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1175.0	900	2100	1164.4	214	159.3	208.3	72.0	9.1	29.00	0.971	1.022	0.976	1.003
2	2100	75	881.0	900	2101	880.9	213.9	121.3	209.6	72.0	9.5	29.09	0.978	1.016	0.979	1.001
3	2100	50	588.0	900	2103	588.9	234.8	90.0	232.4	72.3	9.7	29.03	0.982	1.013	0.984	1.004
4	2100	10	117.0	600	2101	118.8	399.9	31.3	401.2	72.0	9.9	29.03	0.986	1.011	0.985	1.003
5	1500	100	1678.0	600	1501	1677.1	207.0	157.7	200.5	72.0	9.5	29.03	0.979	1.016	0.976	1.002
6	1500	75	1259.0	600	1501	1268.4	211.9	121.9	204.8	72.3	9.8	29.03	0.984	1.012	0.979	1.004
7	1500	50	839.0	600	1499	842.0	214.4	87.0	220.5	73.0	10.1	29.04	0.989	1.008	0.981	1.006
8	900	0	0.0	900	902	4.7	2965.4	4.3	3269.5	74.0	10.4	29.04	0.994	1.005	0.988	1.009

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	465.2	75.44	85.8	1988.0	14.34	223,071	1.0	465.2	0.162	0.184	4.274	0.031	480
2	352.0	90.53	98.0	1365.0	28.64	169,736	1.0	352.0	0.257	0.278	3.878	0.081	482
3	235.5	92.27	117.4	594.0	35.41	125,780	1.0	235.5	0.392	0.499	2.522	0.150	534
4	47.5	100.65	249.9	133.8	37.95	43,232	1.0	47.5	2.121	5.266	2.820	0.800	911
5	478.4	38.15	69.0	2216.9	11.61	220,963	1.0	478.4	0.080	0.144	4.634	0.024	462
6	362.0	44.80	66.8	1340.1	14.10	170,696	1.0	362.0	0.124	0.185	3.702	0.039	472
7	240.0	43.77	80.3	711.4	15.71	121,784	1.0	240.0	0.182	0.334	2.964	0.065	507
8	0.8	32.63	41.7	28.0	5.18	5,847	1.0	0.8	40.788	52.107	34.959	6.475	7309

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
4932-7.7%ETH/RUN186

Test No.: 12549328M2-COR
 Date: 2/6
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
W/ TEMP. CONTROL

Time: DIESEL 2D EM-4932-F
 HCR: 1.835 FID Resp: 1.00
 H= 0.13 C= 0.844 O= 0.026 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air				Factors		
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1170.0	900	2100	1165.4	211	156.4	204.3	72.0	8.9	29.36	0.968	1.025	0.980	0.994
2	2100	75	877.0	900	2101	876.8	210.6	119.7	207.8	72.0	9.3	29.37	0.974	1.020	0.982	0.994
3	2100	50	585.0	900	2104	591.0	231.7	88.9	228.6	72.1	9.0	29.39	0.969	1.024	0.982	0.994
4	2100	10	117.0	600	2102	120.5	394.4	31.5	398.2	72.7	9.4	29.39	0.976	1.018	0.989	0.996
5	1500	100	1675.0	600	1502	1674.1	206.4	155.1	197.4	72.0	8.6	29.40	0.963	1.029	0.979	0.993
6	1500	75	1256.0	600	1502	1246.4	213.6	126.5	216.2	72.0	8.8	29.40	0.966	1.027	0.982	0.993
7	1500	50	837.0	600	1501	842.5	217.1	86.3	218.4	73.0	9.1	29.40	0.971	1.023	0.984	0.996
8	900	0	0.0	900	902	2.8	4236.2	4.4	4779.3	74.0	9.6	29.40	0.981	1.014	0.992	0.999

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wft.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	465.6	76.89	81.1	2048.3	12.26	219,006	1.0	465.6	0.165	0.174	4.399	0.026	470
2	350.4	87.82	93.2	1392.6	26.19	167,375	1.0	350.4	0.251	0.266	3.974	0.075	478
3	236.6	89.95	117.4	609.4	35.58	124,219	1.0	236.6	0.380	0.496	2.576	0.150	525
4	48.1	98.53	236.1	138.9	36.65	43,476	1.0	48.1	2.048	4.907	2.886	0.762	903
5	478.0	37.98	68.0	2232.4	11.54	217,311	1.0	478.0	0.079	0.142	4.671	0.024	455
6	355.9	42.27	75.6	1275.1	13.45	177,213	1.0	355.9	0.119	0.212	3.583	0.038	498
7	240.4	42.14	73.2	719.4	15.38	120,795	1.0	240.4	0.175	0.305	2.993	0.064	503
8	0.6	31.87	41.4	29.2	4.80	5,942	1.0	0.6	56.902	73.969	52.152	8.573	10610

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
4935-10% ETH/RUN 163

Test No.: 12549358M2-COR
 Date: 1/29
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
W/ TEMP. CONTROL

Time: DIESEL 2D EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0

Mode	Target				Measured				C-B	C-B	Intake Air			Factors		
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1150.0	900	2101	1144.0	217	155.8	207.3	72.0	9.2	29.11	0.973	1.020	0.974	1.000
2	2100	75	863.0	900	2101	866.0	216.6	118.9	209.0	72.0	9.6	29.11	0.980	1.015	0.977	1.001
3	2100	50	575.0	900	2101	580.0	237.7	87.5	229.8	72.0	9.6	29.10	0.981	1.015	0.979	1.001
4	2100	10	115.0	600	2102	116.0	412.8	30.9	403.7	72.0	9.6	29.09	0.981	1.014	0.983	1.001
5	1500	100	1650.0	600	1501	1652.0	205.2	155.8	201.1	72.0	9.6	29.09	0.981	1.014	0.975	1.001
6	1500	75	1238.0	600	1500	1239.0	210.8	120.0	206.5	72.0	9.8	29.08	0.983	1.012	0.978	1.002
7	1500	50	825.0	600	1501	825.0	213.0	84.6	218.5	73.0	9.9	29.07	0.985	1.011	0.980	1.005
8	900	0	0.0	900	902	7.0	2382.4	4.3	2179.7	74.6	10.0	29.06	0.987	1.009	0.985	1.010

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	457.2	79.92	74.5	1905.8	13.79	217,586	1.0	457.2	0.175	0.163	4.168	0.030	476
2	346.0	95.92	90.3	1334.2	26.89	165,909	1.0	346.0	0.277	0.261	3.856	0.078	480
3	231.6	93.03	113.0	576.7	31.78	121,951	1.0	231.6	0.402	0.488	2.490	0.137	527
4	46.6	110.65	257.0	132.8	35.53	42,424	1.0	46.6	2.376	5.519	2.853	0.763	911
5	471.3	42.80	59.3	2190.0	11.47	217,742	1.0	471.3	0.091	0.126	4.647	0.024	462
6	353.5	43.85	68.2	1283.0	14.83	167,625	1.0	353.5	0.124	0.193	3.629	0.042	474
7	235.6	41.62	72.7	683.6	14.21	118,147	1.0	235.6	0.177	0.309	2.902	0.060	502
8	1.2	31.44	39.5	23.4	5.25	5,835	1.0	1.2	26.199	32.883	19.523	4.376	4862

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
4935-10%ETH/RUN 165

Test No.: 12549358M3-COR
 Date: 1/30
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
W/ TEMP. CONTROL

Time: DIESEL 2D EM-4935-F
 HCR: 1.882 FID Resp: 1.00
 H= 0.133 C= 0.842 O= 0.025 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1155.0	900	2100	1143.9	216	155.9	207.5	71.4	9.8	29.15	0.984	1.012	0.975	0.998
2	2100	75	866.0	900	2101	868.1	215.4	119.0	208.7	72.0	10.0	29.14	0.987	1.010	0.978	1.000
3	2100	50	578.0	900	2102	579.8	235.2	87.1	228.6	72.0	10.1	29.13	0.990	1.008	0.981	1.001
4	2100	10	116.0	600	2100	117.4	394.6	31.9	414.1	73.0	10.3	29.12	0.992	1.006	0.984	1.004
5	1500	100	1645.0	600	1500	1648.3	207.3	155.3	200.9	72.0	10.1	29.12	0.990	1.008	0.975	1.001
6	1500	75	1234.0	600	1501	1239.0	213.2	121.0	208.2	72.0	10.3	29.13	0.992	1.006	0.978	1.001
7	1500	50	823.0	600	1501	827.8	219.1	84.7	218.1	72.0	10.4	29.13	0.994	1.005	0.980	1.001
8	900	0	0.0	900	902	4.5	2433.1	4.5	3421.6	74.9	10.8	29.14	1.002	0.999	0.987	1.009

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	457.0	85.56	75.0	1938.6	13.29	217,774	1.0	457.0	0.187	0.164	4.242	0.029	477
2	346.8	95.51	86.5	1349.2	27.09	166,011	1.0	346.8	0.275	0.249	3.890	0.078	479
3	231.8	93.26	124.1	589.7	31.49	121,374	1.0	231.8	0.402	0.536	2.545	0.136	524
4	46.9	108.68	258.6	140.4	34.95	43,876	1.0	46.9	2.319	5.518	2.996	0.746	936
5	470.2	43.57	61.8	2232.7	11.76	216,998	1.0	470.2	0.093	0.131	4.749	0.025	462
6	353.5	45.44	66.9	1297.1	14.72	169,105	1.0	353.5	0.129	0.189	3.670	0.042	478
7	236.2	41.77	79.8	702.8	14.74	118,220	1.0	236.2	0.177	0.338	2.975	0.062	500
8	0.8	34.14	43.8	27.0	5.46	6,052	1.0	0.8	42.670	54.796	33.785	6.821	7565

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
4950-15%ETH/RUN 172

Test No.: 12549508M1-COR
 Date: 2/2
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
W/ TEMP. CONTROL

Time: DIESEL 2D EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.13 C= 0.831 O= 0.039 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1130.0	900	2102	1125.5	218	154.1	208.4	72.0	8.4	29.27	0.960	1.032	0.979	0.996
2	2100	75	848.0	900	2100	849.2	218.3	119.1	213.7	72.0	8.3	29.27	0.958	1.033	0.988	0.995
3	2100	50	565.0	900	2101	567.2	238.6	86.7	232.7	73.0	8.7	29.28	0.965	1.027	0.984	0.998
4	2100	10	113.0	600	2103	121.7	407.5	32.1	401.3	72.0	9.1	29.29	0.972	1.022	0.990	0.996
5	1500	100	1635.0	600	1500	1635.3	211.5	155.0	202.3	72.0	8.4	29.30	0.960	1.032	0.981	0.995
6	1500	75	1226.0	600	1501	1222.9	219.8	119.1	207.6	72.0	8.6	29.30	0.963	1.029	0.981	0.995
7	1500	50	818.0	600	1500	822.4	225.4	84.2	218.4	72.0	8.7	29.31	0.964	1.028	0.985	0.995
8	900	0	0.0	900	902	3.1	3125.9	4.3	3632.8	74.0	9.2	29.31	0.973	1.021	0.992	1.001

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	449.9	88.65	72.1	1907.0	12.68	212,344	1.0	449.9	0.197	0.160	4.239	0.028	472
2	339.1	93.72	85.0	1307.5	25.91	164,052	1.0	339.1	0.276	0.251	3.856	0.076	484
3	226.7	85.96	107.7	578.7	28.98	119,266	1.0	226.7	0.379	0.475	2.553	0.128	526
4	48.7	118.46	271.8	150.9	31.15	43,479	1.0	48.7	2.434	5.587	3.101	0.640	894
5	466.1	38.67	48.4	2199.1	9.87	213,887	1.0	466.1	0.083	0.104	4.718	0.021	459
6	349.0	43.38	63.9	1253.5	14.18	164,158	1.0	349.0	0.124	0.183	3.592	0.041	470
7	234.5	40.69	80.1	687.8	14.25	116,001	1.0	234.5	0.174	0.342	2.933	0.061	495
8	0.7	33.08	46.5	29.7	5.42	5,719	1.0	0.7	45.941	64.515	41.294	7.525	7943

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
4950-15%ETH/RUN 178

Test No.: 12549508M2-COR
 Date: 2/4
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
W/ TEMP. CONTROL

Time: DIESEL 2D EM-4950-F
 HCR: 1.864 FID Resp: 1.00
 H= 0.13 C= 0.831 O= 0.039 X= 0

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1140.0	900	2100	1142.9	217	159.1	212.0	72.0	8.5	28.98	0.961	1.031	0.974	1.003
2	2100	75	855.0	900	2100	857.5	217.4	118.5	210.5	72.0	8.5	29.00	0.961	1.030	0.976	1.002
3	2100	50	570.0	900	2101	572.6	238.2	87.6	232.9	72.0	8.9	28.99	0.968	1.024	0.981	1.003
4	2100	10	114.0	600	2101	115.4	415.8	30.8	406.6	73.0	9.0	28.99	0.969	1.024	0.984	1.006
5	1500	100	1640.0	600	1502	1646.7	211.5	155.4	201.0	72.0	8.7	28.98	0.965	1.027	0.975	1.003
6	1500	75	1230.0	600	1500	1228.3	214.9	119.2	207.0	72.0	9.2	28.98	0.972	1.021	0.978	1.003
7	1500	50	820.0	600	1501	822.8	220.9	85.4	221.4	73.0	9.1	28.98	0.972	1.022	0.981	1.006
8	900	0	0.0	900	902	2.3	3345.5	4.1	4156.6	74.5	9.1	28.98	0.972	1.022	0.985	1.010

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	456.5	75.53	75.5	1940.7	13.09	219,330	1.0	456.5	0.165	0.165	4.251	0.029	480
2	342.5	86.90	81.7	1315.4	25.47	163,219	1.0	342.5	0.254	0.238	3.841	0.074	477
3	228.8	84.21	110.6	581.0	29.88	120,509	1.0	228.8	0.368	0.483	2.539	0.131	527
4	46.1	120.71	283.9	151.2	34.56	41,716	1.0	46.1	2.620	6.160	3.282	0.750	905
5	470.2	36.62	51.7	2202.6	11.33	214,343	1.0	470.2	0.078	0.110	4.684	0.024	456
6	350.3	40.72	60.8	1282.9	14.22	164,369	1.0	350.3	0.116	0.174	3.662	0.041	469
7	234.7	38.89	78.0	702.5	14.47	117,708	1.0	234.7	0.166	0.333	2.994	0.062	502
8	0.6	32.82	43.4	37.1	5.53	5,532	1.0	0.6	54.696	72.347	61.896	9.219	9220

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Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
BASE FUEL//RUN 146

Test No.: 12549708M1-COR
 Date: 1/22
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
20X20

Time: DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

W/O TEMP. CONTROL

Mode	Target				Measured			C-B		Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1265.0	900	2100	1251.0	209	167.2	203.3	72.0	9.7	29.39	0.983	1.013	0.977	0.994
2	2100	75	948.0	900	2099	952.0	207.5	126.5	202.5	72.0	10.0	29.40	0.987	1.010	0.979	0.994
3	2100	50	633.0	900	2103	639.0	225.5	93.6	222.9	72.0	10.2	29.40	0.991	1.007	0.983	0.994
4	2100	10	127.0	600	2101	131.0	366.5	32.5	377.0	72.0	10.3	29.41	0.992	1.006	0.987	0.994
5	1500	100	1795.0	600	1500	1797.0	202.2	163.7	194.3	72.0	9.7	29.41	0.983	1.013	0.977	0.994
6	1500	75	1346.0	600	1501	1344.0	209.7	126.6	200.8	72.0	10.0	29.42	0.988	1.009	0.979	0.994
7	1500	50	898.0	600	1501	896.0	213.6	88.6	210.8	72.0	10.4	29.42	0.994	1.004	0.982	0.994
8	900	0	0.0	900	902	2.0	1955.2	3.9	4236.2	75.0	10.8	29.43	1.001	0.999	0.988	1.003

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	500.2	63.24	102.7	2213.4	15.89	240,828	1.0	500.2	0.126	0.205	4.425	0.032	481
2	379.9	69.69	108.0	1535.8	28.33	182,082	1.0	379.9	0.183	0.284	4.043	0.075	479
3	255.5	81.51	119.7	691.0	40.25	134,600	1.0	255.5	0.319	0.469	2.705	0.158	527
4	52.4	93.02	284.6	168.0	47.04	46,145	1.0	52.4	1.774	5.427	3.204	0.897	880
5	512.6	27.91	105.0	2525.9	14.22	235,862	1.0	512.6	0.054	0.205	4.928	0.028	460
6	383.5	29.52	107.1	1448.9	15.45	182,270	1.0	383.5	0.077	0.279	3.778	0.040	475
7	255.7	32.60	86.3	808.0	18.35	127,586	1.0	255.7	0.127	0.338	3.160	0.072	499
8	0.6	22.01	43.1	47.1	5.54	5,546	1.0	0.6	39.309	76.950	84.092	9.891	9904

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
BASE FUEL/RUN 150

Test No.: 12549708M2-COR
 Date: 1/23
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
20X20

Time: DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

W/O TEMP. CONTROL

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1265.0	900	2101	1255.0	209	166.5	202.0	72.0	10.0	29.37	0.988	1.009	0.975	0.995
2	2100	75	949.0	900	2101	954.0	207.3	126.0	201.1	72.0	10.0	29.38	0.988	1.009	0.978	0.995
3	2100	50	633.0	900	2100	638.0	225.7	92.7	221.4	72.0	10.3	29.39	0.992	1.006	0.981	0.995
4	2100	10	127.0	600	2102	128.0	372.3	32.1	380.6	73.0	10.5	29.38	0.995	1.003	0.985	0.998
5	1500	100	1795.0	600	1500	1799.0	201.5	166.6	197.6	72.0	10.0	29.38	0.988	1.009	0.975	0.995
6	1500	75	1346.0	600	1501	1340.0	210.2	126.7	201.6	72.0	10.4	29.38	0.995	1.004	0.979	0.995
7	1500	50	898.0	600	1500	902.0	208.4	88.8	210.1	72.0	10.3	29.38	0.992	1.006	0.981	0.995
8	900	0	0.0	900	902	3.0	3041.4	3.9	4562.1	74.0	10.7	29.38	1.000	1.000	0.988	1.001

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	501.4	61.91	109.7	2256.1	15.59	239,802	1.0	501.4	0.123	0.219	4.499	0.031	478
2	381.2	69.69	109.7	1562.1	28.49	181,280	1.0	381.2	0.183	0.288	4.098	0.075	476
3	254.7	81.34	123.2	679.3	41.58	133,222	1.0	254.7	0.319	0.484	2.667	0.163	523
4	51.3	96.34	287.7	151.1	47.93	45,539	1.0	51.3	1.878	5.608	2.946	0.934	888
5	512.8	31.23	102.4	2537.5	13.92	240,073	1.0	512.8	0.061	0.200	4.949	0.027	468
6	382.3	33.95	112.5	1422.1	16.72	182,434	1.0	382.3	0.089	0.294	3.720	0.044	477
7	257.1	35.49	84.4	803.9	18.72	127,805	1.0	257.1	0.138	0.328	3.127	0.073	497
8	0.5	27.71	42.6	33.0	5.53	5,506	1.0	0.5	53.294	81.863	63.468	10.626	10588

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
BASE FUEL//RUN 222

Test No.: 12549708M3-COR
 Date: 2/24
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
SECOND PAIR OF TESTS

Time: DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

W/ TEMP. CONTROL

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1240.0	900	2100	1234.0	208	165.5	204.2	72.2	10.5	28.90	0.997	1.003	0.971	1.007
2	2100	75	930.0	900	2101	932.0	206.5	125.7	205.3	72.4	11.0	28.89	1.005	0.996	0.975	1.009
3	2100	50	620.0	900	2103	618.0	226.6	91.5	225.1	72.7	11.1	28.90	1.007	0.995	0.977	1.009
4	2100	10	124.0	600	2102	126.0	370.6	31.6	382.7	73.0	11.4	28.91	1.012	0.992	0.981	1.010
5	1500	100	1738.0	600	1501	1738.0	199.4	149.2	196.0	72.5	11.1	28.91	1.008	0.994	0.973	1.009
6	1500	75	1303.0	600	1499	1303.0	209.2	126.0	206.4	72.8	11.0	28.92	1.005	0.996	0.974	1.009
7	1500	50	869.0	600	1502	866.0	213.3	88.4	217.5	73.0	10.8	28.93	1.001	0.999	0.977	1.009
8	900	0	0.0	900	902	-1.0	47141.5	3.9	59307.0	74.0	11.3	28.94	1.012	0.992	0.983	1.012

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	492.9	57.94	122.8	2246.7	17.32	238,317	1.0	492.9	0.118	0.249	4.558	0.035	484
2	372.4	75.60	113.2	1535.0	29.34	180,931	1.0	372.4	0.203	0.304	4.122	0.079	486
3	247.3	83.14	129.9	667.8	41.77	131,467	1.0	247.3	0.336	0.525	2.701	0.169	532
4	50.2	102.64	296.3	162.0	45.29	44,739	1.0	50.2	2.044	5.901	3.226	0.902	891
5	463.1	30.65	84.5	2332.8	11.47	214,992	1.0	463.1	0.066	0.183	5.038	0.025	464
6	371.3	37.03	106.7	1371.2	16.59	181,467	1.0	371.3	0.100	0.287	3.693	0.045	489
7	247.3	40.85	101.9	772.5	21.23	127,226	1.0	247.3	0.165	0.412	3.124	0.086	515
8	0.0	32.79	39.5	37.6	5.86	5,417	1.0	0.0	319.668	986.817	939.276	146.482	135423

Southwest Research Institute - Department of Emissions Research
Part 89, 8-mode Emission Test Results
Project No. 8-06811-001

Engine Model: 2003 Deere 12.5L
 Engine Desc.: 12.5 L (763 CID) IL6
 Engine Cycle: Diesel
 Engine S/N: RG6125HO2204
BASE FUEL/RUN 222

Test No.: 12549708M4-COR
 Date: 2/25
 Program SSDIL: 2.32-R
 Cell: 16 Bag Cart: 1
SECOND PAIR OF TESTS

Time: DIESEL 2D EM-4970-F
 HCR: 1.826 FID Resp: 1.00
 H= 0.133 C= 0.868 O= 0 X= 0

W/ TEMP. CONTROL

Mode	Target				Measured			C-B	C-B	Intake Air			Factors			
	Speed rpm	Load %	Torque ft-lb	Time sec	Speed rpm	Torque ft-lb	BSFC g/kW-hr	Fuel lb/hr	BSFC g/kW-hr	Temp F	Humid g/kg	Baro in-hg	NOx Hum	Part. Hum	Dry Wet	F (TC)
1	2100	100	1240.0	900	2102	1237.0	207	146.6	180.3	72.4	7.9	29.07	0.952	1.038	0.978	1.001
2	2100	75	930.0	900	2101	933.0	205.8	124.2	202.7	72.9	8.0	29.08	0.953	1.037	0.981	1.002
3	2100	50	620.0	900	2101	628.0	226.4	91.5	222.0	72.4	8.2	29.08	0.956	1.035	0.984	1.001
4	2100	10	124.0	600	2101	125.0	372.1	31.4	383.1	73.0	8.2	29.09	0.957	1.034	0.988	1.002
5	1500	100	1760.0	600	1501	1764.0	200.7	163.4	197.4	73.0	7.9	29.10	0.951	1.039	0.978	1.002
6	1500	75	1320.0	600	1501	1313.0	208.8	126.3	205.2	72.6	8.1	29.10	0.954	1.037	0.982	1.001
7	1500	50	880.0	600	1501	881.0	213.3	85.6	207.0	72.9	8.2	29.11	0.956	1.034	0.985	1.002
8	900	0	0.0	900	902	-1.0	13179.3	3.6	18248.3	75.2	8.2	29.11	0.956	1.034	0.990	1.008

Mode	BHP from Work	Grams/Hour					UNWEIGHTED MODAL RESULTS						
		HC	CO	NO _x	Part.	CO ₂	Mode wf.	Power bhp	HC	CO	NO _x	Part.	CO ₂
1	494.5	61.60	115.6	2227.9	18.38	211,013	1.0	494.5	0.125	0.234	4.505	0.037	427
2	372.8	76.72	109.1	1520.7	29.74	178,770	1.0	372.8	0.206	0.293	4.079	0.080	480
3	250.7	85.39	128.1	663.9	43.46	131,440	1.0	250.7	0.341	0.511	2.648	0.173	524
4	49.9	102.83	295.8	152.6	49.28	44,540	1.0	49.9	2.062	5.932	3.060	0.988	893
5	503.4	38.65	82.2	2494.6	13.56	235,446	1.0	503.4	0.077	0.163	4.956	0.027	468
6	374.4	39.91	106.4	1375.3	15.66	181,801	1.0	374.4	0.107	0.284	3.673	0.042	486
7	251.5	43.99	93.1	776.0	19.73	123,184	1.0	251.5	0.175	0.370	3.085	0.078	490
8	0.1	36.18	37.2	23.7	5.06	5,003	1.0	0.1	301.459	309.981	197.792	42.176	41693