APPENDIX A

DIESEL FUEL ANALYSES

TABLE A-1. 1994 CERTIFICATION DIESEL FUEL SPECIFICATIONS
FUEL EM-1749-F

FUEL TYPE 1-D _____ 2-D __X__ SUPPLIER __PHILLIPS 66__

LOT NO. __S-288__ SwRI CODE __EM-1749-F__

Item	CFR Specification[a]			Supplier Analysis	SwRI Analysis
	ASTM	Type 1-D	Type 2-D		
Cetane Number	D613	40-54	40-48	46.0	45.8
Cetane Index	D976	40-54	40-48	47.3	46.6
Distillation Range:					
IBP°F	D86	330-390	340-400	366	361
10% Point, °F	D86	370-430	400-460	438	435
50% Point, °F	D86	410-480	470-540	512	509
90% Point, °F	D86	460-520	560-630	593	593
EP, °F	D86	500-560	610-690	640	639
Gravity, API	D287	40-44	32-37	35.1	35.3
Total Sulfur, %	D2622	0.03-0.05	0.03-0.05	0.035	0.035
Hydrocarbon Composition:					
Aromatics, %	D1319	8[b]	27[b]	29.7	31.4
Paraffins, Naphthenes, Olefins	D1319	c	c	70.3	68.6
Flashpoint, °F	D93	120 (min.)	130 (min.)	189	169
Viscosity, Centistokes	D445	1.6-2.0	2.2-3.4	2.98	2.71

[a]Diesel fuel specification as in CFR 86.113-94(b)(2) for light-duty diesel vehicles and CFR 86.1313-94(b)(2) for heavy-duty diesel engines.
[b]Minimum
[c]Remainder

SwRI Analysis
Date: 3-22-94

TABLE A-2. 1994 HEAVY-DUTY CERTIFICATION DIESEL FUEL SPECIFICATIONS
FUEL EM-1852-F

FUEL TYPE 1-D _____ 2-D __X__ SUPPLIER __PHILLIPS 66__

LOT NO. __S-464__ SwRI CODE __EM-1852-F__

Item	CFR Specification[a]			Supplier Analysis	SwRI Analyses
	ASTM	Type 1-D	Type 2-D		
Cetane Number	D613	40-54	40-48	46.7	45.8
Cetane Index	D976	40-54	40-48	47.7	----
Distillation Range:					
IBP°F	D86	330-390	340-400	369	367
10% Point, °F	D86	370-430	400-460	431	429
50% Point, °F	D86	410-480	470-540	507	507
90% Point, °F	D86	460-520	560-630	597	598
EP, °F	D86	500-560	610-690	640	638
Gravity, API	D287	40-44	32-37	35.6	35.7
Total Sulfur, %	D2622	0.03-0.05	0.03-0.05	0.033	0.032
Hydrocarbon Composition:					
Aromatics, %	D1319	8[b]	27[b]	29.9	35.7
Olefins	D1319	---	---	3.9	8.3
Saturates	D1319	c	c	66.2	56.0
Flashpoint, °F	D93	120 (min.)	130 (min.)	152	172
Viscosity, Centistokes	D455	1.6-2.0	2.0-3.2	2.7	2.59

[a] Diesel fuel specification as in CFR 86.1313-94(b)(2) for heavy-duty diesel engines.
[b] Minimum
[c] Remainder

Supplier Analyses
Date: __8/18/94__

SwRI Analyses
by: __Karen Kohl__
Date: __8/26/94__

APPENDIX B

ENGINE INLET AIR FLOWRATE DATA

Table B-1. Engine Inlet Air Flowrates for Torque-Based Test Modes

Engine: Caterpillar 3116
Model Year: 1993

Test Date: 5/11/94
Project Leader: Martin Heimrich
Project: 08-5744

Ambient Pressure: 29.22 in. Hg

Mode No.	Engine Speed, rpm	Engine Torque, lb-ft	Engine Power, bhp	Fuel Flow, lbm/hr	Boost Pressure Before IC, "Hg	Boost Pressure After IC, "Hg	Inlet Air Temp., deg F	LFE delta P, "H2O	Inlet Air Flowrate, SCFM
1	2600	534	264	103.5	26.2	26.0	90	5.8	725
2	2600	400	198	76.0	23.9	23.7	91	5.4	675
3	2600	268	133	52.4	17.8	17.6	92	4.5	563
4	2600	134	66	31.2	10.6	10.2	88	3.5	438
5	2600	54	27	19.7	7.0	6.6	92	3.0	375
6	1600	677	207	72.5	21.6	21.6	93	3.4	425
7	1600	514	157	53.0	15.0	15.0	91	2.7	338
8	1600	343	105	35.7	8.6	8.6	91	2.1	263
9	1600	171	52	18.2	4.0	3.9	91	1.7	208
10	1600	69	21	9.6	2.3	2.3	91	1.5	189
11	740	0	0	1.3	0.2	0.2	89	0.6	76

LFE S/N: J-41251

Table B-2. Engine Inlet Air Flowrates for Temperature-Based Test Modes

Engine: Caterpillar 3116
Model Year: 1993

Test Date: 4/27/95
Project Leader: Martin Heimrich
Project No. 08-5744

Barometric Pressure: 29.20

Catalyst Inlet Temp., deg C	Engine Speed, rpm	Engine Torque, lb-ft	Engine Power, bhp	Fuel Flow, lbm/hr	Boost Pressure Before IC, "Hg	Boost Pressure After IC, "Hg	Inlet Air Temp., deg F	LFE delta P, "H2O	inlet Air Flowrate SCFM
180	1250	101	24	12.7	1.9	2.0	87	3.0	165
190	1250	114	28	12.4	1.9	2.0	88	3.1	171
200	1250	128	31	14.0	2.2	2.4	87	3.1	171
210	1250	138	33	15.0	2.3	2.6	86	3.2	176
220	1250	155	37	18.4	2.4	2.7	88	3.2	176
230	1250	170	41	18.7	2.7	3.0	87	3.2	176
240	1250	180	43	18.8	2.8	3.1	88	3.3	182
250	1250	194	47	18.6	3.0	3.4	91	3.3	182
260	1250	210	50	20.2	3.3	3.4	89	3.4	187
270	1250	225	54	21.6	3.7	3.7	89	3.4	187
280	1250	238	57	22.7	3.8	4.0	89	3.4	187
290	1250	255	61	22.9	4.0	4.1	88	3.5	193
300	1250	270	65	23.5	4.2	4.4	89	3.5	193
340	1250	340	81	29.1	5.7	5.8	88	3.7	204
380	1250	402	96	35.5			91	4.1	225
420	1250	475	115	43.0	9.5	9.6	89	4.5	248

LFE S/N: S-2865-1

APPENDIX C

HOT-START HEAVY-DUTY FTP TRANSIENT TEST RESULTS
FOR
CATALYST GROUP "A"
FTP TESTS -01 THROUGH -28

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-01 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 8/94 TIME 2:38	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 80.0°F RH 38.0 PCT AH 60.0 GR/LB	ENGINE DEW PT. 8.8°C (47.8°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 7.2 G/KG (50.5 GR/LB)	NOX HUMIDITY C.F. .940
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.6
TOT. BLOWER RATE SCMM (SCFM)	42.90 (1514.9)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.09)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	864.1 (30512.)
HC SAMPLE METER/RANGE/PPM	10.2/ 12/ 10.23
HC BCKGRD METER/RANGE/PPM	4.6/ 12/ 4.60
CO SAMPLE METER/RANGE/PPM	27.5/ 13/ 24.92
CO BCKGRD METER/RANGE/PPM	.3/ 13/ .26
CO2 SAMPLE METER/RANGE/PCT	81.0/ 11/ .7357
CO2 BCKGRD METER/RANGE/PCT	8.5/ 11/ .0516
NOX SAMPLE METER/RANGE/PPM (D)	.7/ 13/ 54.64
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	18.42
HC CONCENTRATION PPM	5.88
CO CONCENTRATION PPM	24.02
CO2 CONCENTRATION PCT	.6868
NOX CONCENTRATION PPM	53.04
HC MASS GRAMS	2.920
CO MASS GRAMS	24.159
CO2 MASS GRAMS	10857.78
NOX MASS GRAMS	82.412
FUEL KG (LB)	3.426 (7.55)
KW HR (HP HR)	13.36 (17.91)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.219(.163)	(.16)	(CONT)	
BSCO G/KW HR (G/HP HR)	1.809(1.349)	(1.35)		
BSNOX G/KW HR (G/HP HR)	6.171(4.601)	(4.60)	(CONT)	
PART. G/KW HR (G/HP HR)	.249(.186)	(.19)		
BSFC KG/KW HR (LB/HP HR)	.257(.422)			
WORK KW HR (HP HR)	13.36(17.91)			
BSCO2 G/KW HR (G/HP HR)	813. (606.)			

90 MM FILTER NUMBERS	P90-1	P90-2
90 MM FILTER WT. GAINS (MG)	2.268	.116
PARTICULATE GRAMS/TEST	3.323	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-B-02 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 8/94 TIME 3:19	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 740.9 MM HG (29.17 IN HG)	CVS: 81.0°F RH 36.0 PCT AH 58.4 GR/LB	ENGINE DEW PT. 9.2°C (48.5°F)
ENGINE AIR TEMP. 25.6°C (78.0°F)	ENGINE ABS. HUM. 7.4 G/KG (52.0 GR/LB)	NOX HUMIDITY C.F. .943
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.7
TOT. BLOWER RATE SCMM (SCFM)	43.77 (1545.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.11)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	881.6 (31131.)
HC SAMPLE METER/RANGE/PPM	10.5/ 12/ 10.48
HC BCKGRD METER/RANGE/PPM	4.0/ 12/ 4.00
CO SAMPLE METER/RANGE/PPM	29.3/ 13/ 26.61
CO BCKGRD METER/RANGE/PPM	.3/ 13/ .26
CO2 SAMPLE METER/RANGE/PCT	82.5/ 11/ .7549
CO2 BCKGRD METER/RANGE/PCT	8.2/ 11/ .0497
NOX SAMPLE METER/RANGE/PPM (D)	.7/ 13/ 55.52
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .31
DILUTION FACTOR	17.95
HC CONCENTRATION PPM	6.71
CO CONCENTRATION PPM	25.68
CO2 CONCENTRATION PCT	.7079
NOX CONCENTRATION PPM	54.11
HC MASS GRAMS	3.396
CO MASS GRAMS	26.357
CO2 MASS GRAMS	11418.13
NOX MASS GRAMS	86.077
FUEL KG (LB)	3.603 (7.94)
KW HR (HP HR)	13.32 (17.86)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.255(.190) (.19) (CONT)	
BSCO G/KW HR (G/HP HR)	1.979(1.476) (1.48)	
BSNOX G/KW HR (G/HP HR)	6.463(4.820) (4.82) (CONT)	
PART. G/KW HR (G/HP HR)	.258(.193) (.19)	
BSFC KG/KW HR (LB/HP HR)	.271(.445)	
WORK KW HR (HP HR)	13.32(17.86)	
BSCO2 G/KW HR (G/HP HR)	857. (639.)	

90 MM FILTER NUMBERS	P90-3	P90-4
90 MM FILTER WT. GAINS (MG)	2.349	.129
PARTICULATE GRAMS/TEST	3.439	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST A1-A-3 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/12/94 TIME 3:43	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 744.5 MM HG (29.31 IN HG)	CVS: 75.0°F RH 28.0 PCT AH 36.9 GR/LB	ENGINE DEW PT. 4.9°C (40.8°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 5.5 G/KG (38.4 GR/LB)	NOX HUMIDITY C.F. .913
		DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.31 (1529.4)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.11)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	871.7 (30781.)
HC SAMPLE METER/RANGE/PPM	7.2/ 12/ 7.19
HC BCKGRD METER/RANGE/PPM	3.9/ 12/ 3.90
CO SAMPLE METER/RANGE/PPM	29.9/ 13/ 27.18
CO BCKGRD METER/RANGE/PPM	.6/ 13/ .52
CO2 SAMPLE METER/RANGE/PCT	83.6/ 11/ .7691
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0453
NOX SAMPLE METER/RANGE/PPM (D)	.7/ 13/ 57.89
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .10
DILUTION FACTOR	17.62
HC CONCENTRATION PPM	3.51
CO CONCENTRATION PPM	26.05
CO2 CONCENTRATION PCT	.7264
NOX CONCENTRATION PPM	56.90
HC MASS GRAMS	1.756
CO MASS GRAMS	26.437
CO2 MASS GRAMS	11583.63
NOX MASS GRAMS	86.629
FUEL KG (LB)	3.654 (8.06)
KW HR (HP HR)	13.24 (17.75)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.133(.099) (.10) (CONT)	90 MM FILTER NUMBERS P90-5 P90-6
BSCO G/KW HR (G/HP HR)	1.997(1.489) (1.49)	90 MM FILTER WT. GAINS (MG) 2.133 .062
BSNOX G/KW HR (G/HP HR)	6.545(4.881) (4.88) (CONT)	PARTICULATE GRAMS/TEST 3.031
PART. G/KW HR (G/HP HR)	.229(.171) (.17)	
BSFC KG/KW HR (LB/HP HR)	.276(.454)	
WORK KW HR (HP HR)	13.24(17.75)	
BSCO2 G/KW HR (G/HP HR)	875. (653.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) I-6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST A1-B-4 RUN
DATE 4/12/94 TIME 4:37
COMPUTER PROGRAM HDT 3.1-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1749-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 744.2 MM HG (29.30 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 78.0°F RH 25.0 PCT AH 36.1 GR/LB
ENGINE ABS. HUM. 5.3 G/KG (37.3 GR/LB)

ENGINE DEW PT. 4.4°C (40.0°F)
NOX HUMIDITY C.F. .911
DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.7
TOT. BLOWER RATE SCMM (SCFM)	43.33 (1530.1)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.08)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	872.9 (30821.)
HC SAMPLE METER/RANGE/PPM	7.5/ 12/ 7.49
HC BCKGRD METER/RANGE/PPM	3.7/ 12/ 3.70
CO SAMPLE METER/RANGE/PPM	28.6/ 13/ 25.95
CO BCKGRD METER/RANGE/PPM	1.0/ 13/ .87
CO2 SAMPLE METER/RANGE/PCT	81.8/ 11/ .7459
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0453
NOX SAMPLE METER/RANGE/PPM (D)	.7/ 13/ 55.76
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .10
DILUTION FACTOR	18.17
HC CONCENTRATION PPM	3.99
CO CONCENTRATION PPM	24.56
CO2 CONCENTRATION PCT	.7031
NOX CONCENTRATION PPM	54.83
HC MASS GRAMS	2.002
CO MASS GRAMS	24.955
CO2 MASS GRAMS	11227.04
NOX MASS GRAMS	83.344
FUEL KG (LB)	3.541 (7.81)
KW HR (HP HR)	13.33 (17.88)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.150(.112) (.11)	(CONT)
BSCO G/KW HR (G/HP HR)	1.872(1.396) (1.40)	
BSNOX G/KW HR (G/HP HR)	6.251(4.661) (4.66)	(CONT)
PART. G/KW HR (G/HP HR)	.216(.161) (.16)	
BSFC KG/KW HR (LB/HP HR)	.266(.437)	
WORK KW HR (HP HR)	13.33(17.88)	
BSCO2 G/KW HR (G/HP HR)	842. (628.)	

90 MM FILTER NUMBERS	P90-7	P90-8
90 MM FILTER WT. GAINS (MG)	1.955	.078
PARTICULATE GRAMS/TEST	2.882	

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CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST A1-A-05F RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/29/94 TIME 11:21	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 740.7 MM HG (29.16 IN HG)	CVS: 76.0°F RH 67.0 PCT AH 92.3 GR/LB	ENGINE DEW PT. 13.1°C (55.6°F)
ENGINE AIR TEMP. 26.1°C (79.0°F)	ENGINE ABS. HUM. 9.7 G/KG (67.8 GR/LB)	NOX HUMIDITY C.F. .982
		DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.27 (1528.0)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.12)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	871.2 (30762.)
HC SAMPLE METER/RANGE/PPM	69.5/ 15/ 695.66
HC BCKGRD METER/RANGE/PPM	.7/ 15/ 7.30
CO SAMPLE METER/RANGE/PPM	36.9/ 13/ 33.89
CO BCKGRD METER/RANGE/PPM	.9/ 13/ .79
CO2 SAMPLE METER/RANGE/PCT	80.1/ 11/ .7113
CO2 BCKGRD METER/RANGE/PCT	7.8/ 11/ .0458
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 45.72
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .21
DILUTION FACTOR	17.36
HC CONCENTRATION PPM	688.78
CO CONCENTRATION PPM	31.98
CO2 CONCENTRATION PCT	.6682
NOX CONCENTRATION PPM	44.28
HC MASS GRAMS	344.698
CO MASS GRAMS	32.432
CO2 MASS GRAMS	10649.57
NOX MASS GRAMS	72.408
FUEL KG (LB)	3.706 (8.17)
KW HR (HP HR)	13.36 (17.91)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	25.809(19.246) (19.25) (CONT)	
BSCO G/KW HR (G/HP HR)	2.428(1.811) (1.81)	
BSNOX G/KW HR (G/HP HR)	5.422(4.043) (4.04) (CONT)	
PART. G/KW HR (G/HP HR)	2.695(2.010) (2.01)	
BSFC KG/KW HR (LB/HP HR)	.278(.456)	
WORK KW HR (HP HR)	13.36(17.91)	
BSCO2 G/KW HR (G/HP HR)	797. (595.)	

90 MM FILTER NUMBERS	P90-11	P90-12
90 MM FILTER WT. GAINS (MG)	*****	2.082
PARTICULATE GRAMS/TEST	36.000	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST NW3-A-06F RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 2/94 TIME 12:30	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 739.9 MM HG (29.13 IN HG)	CVS: 73.0°F RH 78.0 PCT AH 97.6 GR/LB	ENGINE DEW PT. 14.2°C (57.6°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 10.4 G/KG (73.0 GR/LB)	NOX HUMIDITY C.F. .995
		DRY-TO-WET C.F. .971

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.3
TOT. BLOWER RATE SCMM (SCFM)	43.10 (1521.7)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.22)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.1 (30618.)
HC SAMPLE METER/RANGE/PPM	20.0/ 15/ 200.36
HC BCKGRD METER/RANGE/PPM	.9/ 15/ 9.00
CO SAMPLE METER/RANGE/PPM	18.8/ 13/ 16.83
CO BCKGRD METER/RANGE/PPM	1.8/ 13/ 1.57
CO2 SAMPLE METER/RANGE/PCT	81.0/ 11/ .7230
CO2 BCKGRD METER/RANGE/PCT	7.8/ 11/ .0458
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.85
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	18.28
HC CONCENTRATION PPM	191.85
CO CONCENTRATION PPM	14.72
CO2 CONCENTRATION PCT	.6797
NOX CONCENTRATION PPM	45.99
HC MASS GRAMS	95.561
CO MASS GRAMS	14.863
CO2 MASS GRAMS	10782.08
NOX MASS GRAMS	75.879
FUEL KG (LB)	3.490 (7.69)
KW HR (HP HR)	13.36 (17.92)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	7.151(5.333) (5.33) (CONT)	90 MM FILTER NUMBERS P90-13 P90-14
BSCO G/KW HR (G/HP HR)	1.112(.829) (.83)	90 MM FILTER WT. GAINS (MG) 9.571 1.108
BSNOX G/KW HR (G/HP HR)	5.678(4.234) (4.23) (CONT)	PARTICULATE GRAMS/TEST 13.297
PART. G/KW HR (G/HP HR)	.995(.742) (.74)	
BSFC KG/KW HR (LB/HP HR)	.261(.429)	
WORK KW HR (HP HR)	13.36(17.92)	
BSCO2 G/KW HR (G/HP HR)	807. (602.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST P-A-07 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 2/94 TIME 3:01	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 738.6 MM HG (29.08 IN HG)	CVS: 77.0°F RH 63.0 PCT AH 90.9 GR/LB	ENGINE DEW PT. 12.9°C (55.2°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 9.6 G/KG (67.0 GR/LB)	NOX HUMIDITY C.F. .980
		DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.2
TOT. BLOWER RATE SCMM (SCFM)	43.06 (1520.3)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.21)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.0 (30613.)
HC SAMPLE METER/RANGE/PPM	7.2/ 12/ 7.21
HC BCKGRD METER/RANGE/PPM	7.2/ 12/ 7.20
CO SAMPLE METER/RANGE/PPM	3.4/ 13/ 2.98
CO BCKGRD METER/RANGE/PPM	.7/ 13/ .61
CO2 SAMPLE METER/RANGE/PCT	81.5/ 11/ .7295
CO2 BCKGRD METER/RANGE/PCT	8.0/ 11/ .0470
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 50.08
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .21
DILUTION FACTOR	18.63
HC CONCENTRATION PPM	.39
CO CONCENTRATION PPM	2.31
CO2 CONCENTRATION PCT	.6850
NOX CONCENTRATION PPM	48.52
HC MASS GRAMS	.195
CO MASS GRAMS	2.333
CO2 MASS GRAMS	10864.27
NOX MASS GRAMS	78.808
FUEL KG (LB)	3.414 (7.53)
KW HR (HP HR)	13.35 (17.90)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.015(.011)	(.01)	(CONT)	
BSCO G/KW HR (G/HP HR)	.175(.130)	(.13)		
BSNOX G/KW HR (G/HP HR)	5.904(4.403)	(4.40)	(CONT)	
PART. G/KW HR (G/HP HR)	.214(.159)	(.16)		
BSFC KG/KW HR (LB/HP HR)	.256(.421)			
WORK KW HR (HP HR)	13.35(17.90)			
BSCO2 G/KW HR (G/HP HR)	814. (607.)			

90 MM FILTER NUMBERS	P90-15	P90-16
90 MM FILTER WT. GAINS (MG)	2.211	.059
PARTICULATE GRAMS/TEST	2.853	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) I-6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST P-B-08-F RUN
DATE 5/ 2/94 TIME 3:41
COMPUTER PROGRAM HDT 3.1-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1749-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 738.1 MM HG (29.06 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 77.0°F RH 63.0 PCT AH 91.0 GR/LB
ENGINE ABS. HUM. 9.8 G/KG (68.5 GR/LB)

ENGINE DEW PT. 13.2°C (55.8°F)
NOX HUMIDITY C.F. .983
DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.04 (1519.6)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.31)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	866.3 (30589.)
HC SAMPLE METER/RANGE/PPM	13.2/ 15/ 132.02
HC BCKGRD METER/RANGE/PPM	.6/ 15/ 6.00
CO SAMPLE METER/RANGE/PPM	11.1/ 13/ 9.83
CO BCKGRD METER/RANGE/PPM	1.9/ 13/ 1.66
CO2 SAMPLE METER/RANGE/PCT	82.5/ 11/ .7426
CO2 BCKGRD METER/RANGE/PCT	7.9/ 11/ .0464
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.44
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	17.99
HC CONCENTRATION PPM	126.35
CO CONCENTRATION PPM	7.95
CO2 CONCENTRATION PCT	.6988
NOX CONCENTRATION PPM	44.68
HC MASS GRAMS	62.874
CO MASS GRAMS	8.022
CO2 MASS GRAMS	11074.25
NOX MASS GRAMS	72.799
FUEL KG (LB)	3.546 (7.82)
KW HR (HP HR)	13.34 (17.89)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	4.713(3.514) (3.51) (CONT)	
BSCO G/KW HR (G/HP HR)	.601(.448) (.45)	
BSNOX G/KW HR (G/HP HR)	5.457(4.069) (4.07) (CONT)	
PART. G/KW HR (G/HP HR)	.689(.514) (.51)	
BSFC KG/KW HR (LB/HP HR)	.266(.437)	
WORK KW HR (HP HR)	13.34(17.89)	
BSCO2 G/KW HR (G/HP HR)	830. (619.)	

90 MM FILTER NUMBERS	P90-17	P90-18
90 MM FILTER WT. GAINS (MG)	6.997	.951
PARTICULATE GRAMS/TEST	9.196	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM-A-09 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 3/94 TIME	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.9 MM HG (29.21 IN HG)	CVS: 75.0°F RH 55.0 PCT AH 73.2 GR/LB	ENGINE DEW PT. 12.0°C (53.6°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 9.0 G/KG (62.8 GR/LB)	NOX HUMIDITY C.F. .969
		DRY-TO-WET C.F. .977

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.9
TOT. BLOWER RATE SCMM (SCFM)	43.36 (1531.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.22)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	873.0 (30825.)
HC SAMPLE METER/RANGE/PPM	3.8/ 12/ 3.80
HC BCKGRD METER/RANGE/PPM	4.0/ 12/ 4.00
CO SAMPLE METER/RANGE/PPM	.1/ 13/ .09
CO BCKGRD METER/RANGE/PPM	.1/ 13/ .09
CO2 SAMPLE METER/RANGE/PCT	79.6/ 11/ .7049
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 49.26
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .42
DILUTION FACTOR	19.30
HC CONCENTRATION PPM	.00
CO CONCENTRATION PPM	.00
CO2 CONCENTRATION PCT	.6667
NOX CONCENTRATION PPM	47.73
HC MASS GRAMS	.001
CO MASS GRAMS	.003
CO2 MASS GRAMS	10648.04
NOX MASS GRAMS	77.249
FUEL KG (LB)	3.345 (7.37)
KW HR (HP HR)	13.34 (17.89)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(.000) (.00) (CONT)	90 MM FILTER NUMBERS	P90-19	P90-20
BSCO G/KW HR (G/HP HR)	.000(.000) (.00)	90 MM FILTER WT. GAINS (MG)	2.013	.054
BSNOX G/KW HR (G/HP HR)	5.791(4.318) (4.32) (CONT)	PARTICULATE GRAMS/TEST	2.599	
PART. G/KW HR (G/HP HR)	.195(.145) (.15)			
BSFC KG/KW HR (LB/HP HR)	.251(.412)			
WORK KW HR (HP HR)	13.34(17.89)			
BSCO2 G/KW HR (G/HP HR)	798. (595.)			

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM-B-10F RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 3/94 TIME 12:33	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 75.0°F RH 59.0 PCT AH 78.2 GR/LB	ENGINE DEW PT. 11.4°C (52.6°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 8.7 G/KG (60.6 GR/LB)	NOX HUMIDITY C.F. .964
		DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.6
TOT. BLOWER RATE SCMM (SCFM)	43.27 (1527.9)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.22)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	870.9 (30751.)
HC SAMPLE METER/RANGE/PPM	2.6/ 15/ 25.78
HC BCKGRD METER/RANGE/PPM	.4/ 15/ 4.00
CO SAMPLE METER/RANGE/PPM	2.0/ 13/ 1.75
CO BCKGRD METER/RANGE/PPM	.2/ 13/ .17
CO2 SAMPLE METER/RANGE/PCT	82.9/ 11/ .7479
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.87
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	18.13
HC CONCENTRATION PPM	22.00
CO CONCENTRATION PPM	1.53
CO2 CONCENTRATION PCT	.7098
NOX CONCENTRATION PPH	43.28
HC MASS GRAMS	11.008
CO MASS GRAMS	1.551
CO2 MASS GRAMS	11309.13
NOX MASS GRAMS	69.476
FUEL KG (LB)	3.565 (7.86)
KW HR (HP HR)	13.33 (17.88)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.826(	.616) (	.62)	(CONT)
BSCO G/KW HR (G/HP HR)	.116(	.087) (	.09)	
BSNOX G/KW HR (G/HP HR)	5.211(	3.886) (	3.89)	(CONT)
PART. G/KW HR (G/HP HR)	.247(	.184) (	.18)	
BSFC KG/KW HR (LB/HP HR)	.267(	.440)		
WORK KW HR (HP HR)	13.33(	17.88)		
BSCO2 G/KW HR (G/HP HR)	848. (	633.)		

90 MM FILTER NUMBERS	P90-21	P90-22
90 MM FILTER WT. GAINS (MG)	2.483	.150
PARTICULATE GRAMS/TEST	3.296	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST A1/P-A-11 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 4/94 TIME 12:21	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 744.2 MM HG (29.30 IN HG)	CVS: 75.0°F RH 59.0 PCT AH 77.9 GR/LB	ENGINE DEW PT. 13.3°C (56.0°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 9.8 G/KG (68.5 GR/LB)	NOX HUMIDITY C.F. .983
		DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.52 (1536.6)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.33)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	876.0 (30931.)
HC SAMPLE METER/RANGE/PPM	4.5/ 12/ 4.54
HC BCKGRD METER/RANGE/PPM	5.0/ 12/ 5.00
CO SAMPLE METER/RANGE/PPM	1.5/ 13/ 1.31
CO BCKGRD METER/RANGE/PPM	.3/ 13/ .26
CO2 SAMPLE METER/RANGE/PCT	80.9/ 11/ .7217
CO2 BCKGRD METER/RANGE/PCT	7.1/ 11/ .0415
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.27
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .21
DILUTION FACTOR	18.85
HC CONCENTRATION PPM	-.20
CO CONCENTRATION PPM	1.03
CO2 CONCENTRATION PCT	.6824
NOX CONCENTRATION PPM	46.91
HC MASS GRAMS	.000
CO MASS GRAMS	1.046
CO2 MASS GRAMS	10935.48
NOX MASS GRAMS	77.266
FUEL KG (LB)	3.436 (7.57)
KW HR (HP HR)	13.35 (17.90)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(.000)	(.00)	(CONT)	
BSCO G/KW HR (G/HP HR)	.078(.058)	(.06)		
BSNOX G/KW HR (G/HP HR)	5.789(4.317)	(4.32)	(CONT)	
PART. G/KW HR (G/HP HR)	.202(.151)	(.15)		
BSFC KG/KW HR (LB/HP HR)	.257(.423)			
WORK KW HR (HP HR)	13.35(17.90)			
BSCO2 G/KW HR (G/HP HR)	819. (611.)			

90 MM FILTER NUMBERS	P90-23	P90-24
90 MM FILTER WT. GAINS (MG)	2.281	.059
PARTICULATE GRAMS/TEST	2.703	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) I-6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST A1/P-B-12F RUN
DATE 5/ 4/94 TIME 1:01
COMPUTER PROGRAM HDT 3.1-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1749-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 743.7 MM HG (29.28 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 76.0°F RH 55.0 PCT AH 76.3 GR/LB
ENGINE ABS. HUM. 9.2 G/KG (64.6 GR/LB)

ENGINE DEW PT. 12.4°C (54.4°F)
NOX HUMIDITY C.F. .974
DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.3
TOT. BLOWER RATE SCMM (SCFM)	43.34 (1530.2)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.36)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	872.1 (30792.)
HC SAMPLE METER/RANGE/PPM	11.7/ 15/ 116.90
HC BCKGRD METER/RANGE/PPM	.6/ 15/ 6.00
CO SAMPLE METER/RANGE/PPM	9.0/ 13/ 7.95
CO BCKGRD METER/RANGE/PPM	3.3/ 13/ 2.89
CO2 SAMPLE METER/RANGE/PCT	84.1/ 11/ .7639
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.54
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .42
DILUTION FACTOR	17.53
HC CONCENTRATION PPM	111.24
CO CONCENTRATION PPM	5.01
CO2 CONCENTRATION PCT	.7225
NOX CONCENTRATION PPM	43.07
HC MASS GRAMS	55.722
CO MASS GRAMS	5.089
CO2 MASS GRAMS	11525.61
NOX MASS GRAMS	69.935
FUEL KG (LB)	3.679 (8.11)
KW HR (HP HR)	13.33 (17.88)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	4.179(3.116) (3.12) (CONT)
BSCO G/KW HR (G/HP HR)	.382(.285) (.28)
BSNOX G/KW HR (G/HP HR)	5.245(3.911) (3.91) (CONT)
PART. G/KW HR (G/HP HR)	.548(.409) (.41)
BSFC KG/KW HR (LB/HP HR)	.276(.454)
WORK KW HR (HP HR)	13.33(17.88)
BSCO2 G/KW HR (G/HP HR)	864. (645.)

90 MM FILTER NUMBERS	P90-25	P90-26
90 MM FILTER WT. GAINS (MG)	5.706	.798
PARTICULATE GRAMS/TEST	7.309	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST P/A1-A-13 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 4/94 TIME 2:50	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 742.7 MM HG (29.24 IN HG)	CVS: 78.0°F RH 53.0 PCT AH 78.1 GR/LB	ENGINE DEW PT. 11.4°C (52.5°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 8.6 G/KG (60.3 GR/LB)	NOX HUMIDITY C.F. .963
		DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.9
TOT. BLOWER RATE SCMM (SCFM)	43.48 (1535.3)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.34)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	875.4 (30909.)
HC SAMPLE METER/RANGE/PPM	4.7/ 12/ 4.68
HC BCKGRD METER/RANGE/PPM	5.0/ 12/ 5.00
CO SAMPLE METER/RANGE/PPM	6.8/ 13/ 5.99
CO BCKGRD METER/RANGE/PPM	2.7/ 13/ 2.36
CO2 SAMPLE METER/RANGE/PCT	82.7/ 11/ .7452
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 51.28
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	18.24
HC CONCENTRATION PPM	-.05
CO CONCENTRATION PPM	3.60
CO2 CONCENTRATION PCT	.7025
NOX CONCENTRATION PPM	49.54
HC MASS GRAMS	.000
CO MASS GRAMS	3.673
CO2 MASS GRAMS	11250.39
NOX MASS GRAMS	79.863
FUEL KG (LB)	3.536 (7.80)
KW HR (HP HR)	13.27 (17.79)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(.000) (.00) (CONT)	90 MM FILTER NUMBERS P90-27 P90-28
BSCO G/KW HR (G/HP HR)	.277(.206) (.21)	90 MM FILTER WT. GAINS (MG) 2.318 .047
BSNOX G/KW HR (G/HP HR)	6.020(4.489) (4.49) (CONT)	PARTICULATE GRAMS/TEST 2.719
PART. G/KW HR (G/HP HR)	.205(.153) (.15)	
BSFC KG/KW HR (LB/HP HR)	.267(.438)	
WORK KW HR (HP HR)	13.27(17.79)	
BSCO2 G/KW HR (G/HP HR)	848. (632.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) I-6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST P/A1-B-14F RUN
DATE 5/ 4/94 TIME 3:30
COMPUTER PROGRAM HDT 3.1-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1749-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 742.7 MM HG (29.24 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 78.0°F RH 53.0 PCT AH 78.1 GR/LB
ENGINE ABS. HUM. 9.1 G/KG (63.7 GR/LB)

ENGINE DEW PT. 12.2°C (54.0°F)
NOX HUMIDITY C.F. .971
DRY-TO-WET C.F. .975

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.17 (1524.4)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.33)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	869.0 (30685.)
HC SAMPLE METER/RANGE/PPM	8.8/ 15/ 88.21
HC BCKGRD METER/RANGE/PPM	.5/ 15/ 5.00
CO SAMPLE METER/RANGE/PPM	19.4/ 13/ 17.38
CO BCKGRD METER/RANGE/PPM	.1/ 13/ .09
CO2 SAMPLE METER/RANGE/PCT	85.7/ 11/ .7856
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.35
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .31
DILUTION FACTOR	17.10
HC CONCENTRATION PPM	83.50
CO CONCENTRATION PPM	16.74
CO2 CONCENTRATION PCT	.7436
NOX CONCENTRATION PPM	44.91
HC MASS GRAMS	41.682
CO MASS GRAMS	16.937
CO2 MASS GRAMS	11821.52
NOX MASS GRAMS	72.503
FUEL KG (LB)	3.764 (8.30)
KW HR (HP HR)	13.27 (17.79)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	3.142(2.343) (2.34) (CONT)
BSCO G/KW HR (G/HP HR)	1.277(.952) (.95)
BSNOX G/KW HR (G/HP HR)	5.465(4.075) (4.08) (CONT)
PART. G/KW HR (G/HP HR)	.353(.264) (.26)
BSFC KG/KW HR (LB/HP HR)	.284(.466)
WORK KW HR (HP HR)	13.27(17.79)
BSCO2 G/KW HR (G/HP HR)	891. (665.)

90 MM FILTER NUMBERS	P90-29	P90-30
90 MM FILTER WT. GAINS (MG)	3.640	.451
PARTICULATE GRAMS/TEST	4.689	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST D1-A-15 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 5/94 TIME 11:51	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 746.0 MM HG (29.37 IN HG)	CVS: 75.0°F RH 59.0 PCT AH 77.7 GR/LB	ENGINE DEW PT. 12.0°C (53.6°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 8.9 G/KG (62.5 GR/LB)	NOX HUMIDITY C.F. .969
		DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.69 (1542.6)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.26)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	879.6 (31060.)
HC SAMPLE METER/RANGE/PPM	5.9/ 12/ 5.87
HC BCKGRD METER/RANGE/PPM	6.0/ 12/ 6.00
CO SAMPLE METER/RANGE/PPM	2.3/ 13/ 2.01
CO BCKGRD METER/RANGE/PPM	.5/ 13/ .44
CO2 SAMPLE METER/RANGE/PCT	80.0/ 11/ .7101
CO2 BCKGRD METER/RANGE/PCT	8.0/ 11/ .0470
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 49.76
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .31
DILUTION FACTOR	19.15
HC CONCENTRATION PPM	.18
CO CONCENTRATION PPM	1.54
CO2 CONCENTRATION PCT	.6655
NOX CONCENTRATION PPM	48.27
HC MASS GRAMS	.092
CO MASS GRAMS	1.579
CO2 MASS GRAMS	10709.12
NOX MASS GRAMS	78.642
FUEL KG (LB)	3.365 (7.42)
KW HR (HP HR)	13.36 (17.91)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.007(.005)	(.01)	(CONT)	
BSCO G/KW HR (G/HP HR)	.118(.088)	(.09)		
BSNOX G/KW HR (G/HP HR)	5.888(4.391)	(4.39)	(CONT)	
PART. G/KW HR (G/HP HR)	.191(.143)	(.14)		
BSFC KG/KW HR (LB/HP HR)	.252(.414)			
WORK KW HR (HP HR)	13.36(17.91)			
BSCO2 G/KW HR (G/HP HR)	802. (598.)			

90 MM FILTER NUMBERS	P90-31	P90-32
90 MM FILTER WT. GAINS (MG)	2.029	.054
PARTICULATE GRAMS/TEST	2.556	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST D1-B-16F RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 5/94 TIME 12:31	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	
BAROMETER 743.2 MM HG (29.26 IN HG)	CVS: 76.0°F RH 59.0 PCT AH 81.4 GR/LB	ENGINE DEW PT. 12.0°C (53.6°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 9.0 G/KG (62.7 GR/LB)	NOX HUMIDITY C.F. .969
		DRY-TO-WET C.F. .975

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.4
TOT. BLOWER RATE SCMM (SCFM)	43.44 (1534.0)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.29)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	874.2 (30869.)
HC SAMPLE METER/RANGE/PPM	13.6/ 15/ 136.35
HC BCKGRD METER/RANGE/PPM	.6/ 15/ 6.00
CO SAMPLE METER/RANGE/PPM	6.2/ 13/ 5.46
CO BCKGRD METER/RANGE/PPM	.6/ 13/ .52
CO2 SAMPLE METER/RANGE/PCT	83.3/ 11/ .7532
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.41
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .21
DILUTION FACTOR	17.74
HC CONCENTRATION PPM	130.68
CO CONCENTRATION PPM	4.79
CO2 CONCENTRATION PCT	.7112
NOX CONCENTRATION PPM	45.04
HC MASS GRAMS	65.627
CO MASS GRAMS	4.873
CO2 MASS GRAMS	11373.56
NOX MASS GRAMS	72.976
FUEL KG (LB)	3.641 (8.03)
KW HR (HP HR)	13.36 (17.92)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	4.911(3.662) (3.66) (CONT)	90 MM FILTER NUMBERS	P90-33 P90-34
BSCO G/KW HR (G/HP HR)	.365(.272) (.27)	90 MM FILTER WT. GAINS (MG)	6.261 .843
BSNOX G/KW HR (G/HP HR)	5.461(4.072) (4.07) (CONT)	PARTICULATE GRAMS/TEST	8.468
PART. G/KW HR (G/HP HR)	.634(.473) (.47)		
BSFC KG/KW HR (LB/HP HR)	.272(.448)		
WORK KW HR (HP HR)	13.36(17.92)		
BSCO2 G/KW HR (G/HP HR)	851. (635.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST D2-A-17 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 5/94 TIME 3:16	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 744.7 MM HG (29.32 IN HG)	CVS: 78.0°F RH 57.0 PCT AH 83.0 GR/LB	ENGINE DEW PT. 13.0°C (55.4°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 9.6 G/KG (66.9 GR/LB)	NOX HUMIDITY C.F. .979
		DRY-TO-WET C.F. .974

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.9
TOT. BLOWER RATE SCMM (SCFM)	43.40 (1532.3)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.28)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	873.6 (30848.)
HC SAMPLE METER/RANGE/PPM	5.5/ 12/ 5.48
HC BCKGRD METER/RANGE/PPM	5.7/ 12/ 5.70
CO SAMPLE METER/RANGE/PPM	4.8/ 13/ 4.22
CO BCKGRD METER/RANGE/PPM	2.2/ 13/ 1.93
CO2 SAMPLE METER/RANGE/PCT	83.2/ 11/ .7519
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 50.98
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .10
DILUTION FACTOR	18.08
HC CONCENTRATION PPM	.09
CO CONCENTRATION PPM	2.29
CO2 CONCENTRATION PCT	.7104
NOX CONCENTRATION PPM	49.58
HC MASS GRAMS	.046
CO MASS GRAMS	2.332
CO2 MASS GRAMS	11353.19
NOX MASS GRAMS	81.124
FUEL KG (LB)	3.568 (7.87)
KW HR (HP HR)	13.31 (17.85)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.003(.003)	(.00)	(CONT)	
BSCO G/KW HR (G/HP HR)	.175(.131)	(.13)		
BSNOX G/KW HR (G/HP HR)	6.095(4.545)	(4.54)	(CONT)	
PART. G/KW HR (G/HP HR)	.214(.159)	(.16)		
BSFC KG/KW HR (LB/HP HR)	.268(.441)			
WORK KW HR (HP HR)	13.31(17.85)			
BSCO2 G/KW HR (G/HP HR)	853. (636.)			

90 MM FILTER NUMBERS	P90-35	P90-36
90 MM FILTER WT. GAINS (MG)	2.318	.052
PARTICULATE GRAMS/TEST	2.843	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST D2-B-18F RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 5/94 TIME 3:56	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 744.0 MM HG (29.29 IN HG)	CVS: 78.0°F RH 57.0 PCT AH 83.1 GR/LB	ENGINE DEW PT. 14.2°C (57.5°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 10.3 G/KG (72.4 GR/LB)	NOX HUMIDITY C.F. .993
		DRY-TO-WET C.F. .974

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.0
TOT. BLOWER RATE SCMM (SCFM)	43.11 (1522.2)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.31)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.0 (30647.)
HC SAMPLE METER/RANGE/PPM	13.9/ 15/ 138.67
HC BCKGRD METER/RANGE/PPM	.6/ 15/ 6.00
CO SAMPLE METER/RANGE/PPM	7.9/ 13/ 6.97
CO BCKGRD METER/RANGE/PPM	1.3/ 13/ 1.14
CO2 SAMPLE METER/RANGE/PCT	86.1/ 11/ .7910
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.58
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .42
DILUTION FACTOR	16.90
HC CONCENTRATION PPM	133.02
CO CONCENTRATION PPM	5.69
CO2 CONCENTRATION PCT	.7514
NOX CONCENTRATION PPM	44.98
HC MASS GRAMS	66.321
CO MASS GRAMS	5.745
CO2 MASS GRAMS	11931.28
NOX MASS GRAMS	74.151
FUEL KG (LB)	3.817 (8.42)
KW HR (HP HR)	13.30 (17.83)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	4.988(3.720) (3.72) (CONT)	90 MM FILTER NUMBERS P90-37 P90-38
BSCO G/KW HR (G/HP HR)	.432(.322) (.32)	90 MM FILTER WT. GAINS (MG) 6.831 .995
BSNOX G/KW HR (G/HP HR)	5.577(4.159) (4.16) (CONT)	PARTICULATE GRAMS/TEST 9.102
PART. G/KW HR (G/HP HR)	.685(.510) (.51)	
BSFC KG/KW HR (LB/HP HR)	.287(.472)	
WORK KW HR (HP HR)	13.30(17.83)	
BSCO2 G/KW HR (G/HP HR)	897. (669.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM-A-19FI RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 6/94 TIME 11:34	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 742.4 MM HG (29.23 IN HG)	CVS: 78.0°F RH 64.0 PCT AH 94.1 GR/LB	ENGINE DEW PT. 11.7°C (53.0°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 8.8 G/KG (61.4 GR/LB)	NOX HUMIDITY C.F. .966
		DRY-TO-WET C.F. .972

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.3
TOT. BLOWER RATE SCMM (SCFM)	43.13 (1523.0)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.23)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.6 (30669.)
HC SAMPLE METER/RANGE/PPM	1.7/ 15/ 17.06
HC BCKGRD METER/RANGE/PPM	1.0/ 15/ 10.00
CO SAMPLE METER/RANGE/PPM	2.6/ 13/ 2.28
CO BCKGRD METER/RANGE/PPM	1.7/ 13/ 1.49
CO2 SAMPLE METER/RANGE/PCT	82.7/ 11/ .7452
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.89
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .42
DILUTION FACTOR	18.22
HC CONCENTRATION PPM	7.61
CO CONCENTRATION PPM	.82
CO2 CONCENTRATION PCT	.7025
NOX CONCENTRATION PPM	43.24
HC MASS GRAMS	3.795
CO MASS GRAMS	.831
CO2 MASS GRAMS	11163.28
NOX MASS GRAMS	69.371
FUEL KG (LB)	3.511 (7.74)
KW HR (HP HR)	13.35 (17.90)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.284(	.212) (	.21) (CONT)	90 MM FILTER NUMBERS	P90-39	P90-40
BSCO G/KW HR (G/HP HR)	.062(	.046) (	.05)	90 MM FILTER WT. GAINS (MG)	2.399	.065
BSNOX G/KW HR (G/HP HR)	5.197(	3.875) (	3.88) (CONT)	PARTICULATE GRAMS/TEST	3.046	
PART. G/KW HR (G/HP HR)	.228(	.170) (	.17)			
BSFC KG/KW HR (LB/HP HR)	.263(	.432)				
WORK KW HR (HP HR)	13.35(	17.90)				
BSCO2 G/KW HR (G/HP HR)	836. (	624.)				

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM-B-20F RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 6/94 TIME 12:14	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 742.4 MM HG (29.23 IN HG)	CVS: 78.0°F RH 67.0 PCT AH 99.7 GR/LB	ENGINE DEW PT. 13.8°C (56.8°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 10.1 G/KG (70.7 GR/LB)	NOX HUMIDITY C.F. .989
		DRY-TO-WET C.F. .970

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.3
TOT. BLOWER RATE SCMM (SCFM)	43.12 (1522.7)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.33)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.5 (30665.)
HC SAMPLE METER/RANGE/PPM	4.1/ 15/ 40.68
HC BCKGRD METER/RANGE/PPM	.6/ 15/ 6.00
CO SAMPLE METER/RANGE/PPM	2.7/ 13/ 2.36
CO BCKGRD METER/RANGE/PPM	1.2/ 13/ 1.05
CO2 SAMPLE METER/RANGE/PCT	84.8/ 11/ .7733
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.34
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .62
DILUTION FACTOR	17.50
HC CONCENTRATION PPM	35.02
CO CONCENTRATION PPM	1.31
CO2 CONCENTRATION PCT	.7307
NOX CONCENTRATION PPM	42.44
HC MASS GRAMS	17.472
CO MASS GRAMS	1.326
CO2 MASS GRAMS	11609.53
NOX MASS GRAMS	69.708
FUEL KG (LB)	3.665 (8.08)
KW HR (HP HR)	13.36 (17.91)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.308(.976) (.98) (CONT)	90 MM FILTER NUMBERS P90-41 P90-42
BSCO G/KW HR (G/HP HR)	.099(.074) (.07)	90 MM FILTER WT. GAINS (MG) 3.174 .201
BSNOX G/KW HR (G/HP HR)	5.219(3.892) (3.89) (CONT)	PARTICULATE GRAMS/TEST 3.868
PART. G/KW HR (G/HP HR)	.290(.216) (.22)	
BSFC KG/KW HR (LB/HP HR)	.274(.451)	
WORK KW HR (HP HR)	13.36(17.91)	
BSCO2 G/KW HR (G/HP HR)	869. (648.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST D2/D1-A-21 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 6/94 TIME 2:07	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 81.0°F RH 61.0 PCT AH 100.4 GR/LB	ENGINE DEW PT. 13.1°C (55.5°F)
ENGINE AIR TEMP. 25.6°C (78.0°F)	ENGINE ABS. HUM. 9.6 G/KG (67.4 GR/LB)	NOX HUMIDITY C.F. .981
		DRY-TO-WET C.F. .971

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	42.99 (1518.0)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.31)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	865.2 (30551.)
HC SAMPLE METER/RANGE/PPM	5.1/ 12/ 5.11
HC BCKGRD METER/RANGE/PPM	5.7/ 12/ 5.70
CO SAMPLE METER/RANGE/PPM	2.3/ 13/ 2.01
CO BCKGRD METER/RANGE/PPM	2.5/ 13/ 2.19
CO2 SAMPLE METER/RANGE/PCT	82.3/ 11/ .7400
CO2 BCKGRD METER/RANGE/PCT	8.0/ 11/ .0470
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 50.93
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .83
DILUTION FACTOR	18.38
HC CONCENTRATION PPM	-.28
CO CONCENTRATION PPM	-.08
CO2 CONCENTRATION PCT	.6955
NOX CONCENTRATION PPM	48.65
HC MASS GRAMS	.000
CO MASS GRAMS	.000
CO2 MASS GRAMS	11008.80
NOX MASS GRAMS	78.946
FUEL KG (LB)	3.458 (7.62)
KW HR (HP HR)	13.37 (17.93)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(	.000)	(.00)	(CONT)
BSCO G/KW HR (G/HP HR)	.000(	.000)	(.00)	
BSNOX G/KW HR (G/HP HR)	5.905(	4.403)	(4.40)	(CONT)
PART. G/KW HR (G/HP HR)	.206(	.153)	(.15)	
BSFC KG/KW HR (LB/HP HR)	.259(	.425)		
WORK KW HR (HP HR)	13.37(	17.93)		
BSCO2 G/KW HR (G/HP HR)	823. (	614.)		

90 MM FILTER NUMBERS	P90-43	P90-44
90 MM FILTER WT. GAINS (MG)	2.336	.044
PARTICULATE GRAMS/TEST	2.752	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST D2/D1-B-22FI RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 6/94 TIME 2:47	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.2 MM HG (29.18 IN HG)	CVS: 81.0°F RH 65.0 PCT AH 106.3 GR/LB	ENGINE DEW PT. 12.8°C (55.0°F)
ENGINE AIR TEMP. 25.6°C (78.0°F)	ENGINE ABS. HUM. 9.5 G/KG (66.3 GR/LB)	NOX HUMIDITY C.F. .978
		DRY-TO-WET C.F. .969

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.3
TOT. BLOWER RATE SCMM (SCFM)	42.96 (1517.0)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.28)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	864.5 (30526.)
HC SAMPLE METER/RANGE/PPM	2.1/ 15/ 21.13
HC BCKGRD METER/RANGE/PPM	.6/ 15/ 6.00
CO SAMPLE METER/RANGE/PPM	4.3/ 13/ 3.77
CO BCKGRD METER/RANGE/PPM	4.2/ 13/ 3.69
CO2 SAMPLE METER/RANGE/PCT	84.2/ 11/ .7652
CO2 BCKGRD METER/RANGE/PCT	7.8/ 11/ .0458
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 46.05
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .73
DILUTION FACTOR	17.73
HC CONCENTRATION PPM	15.47
CO CONCENTRATION PPM	.24
CO2 CONCENTRATION PCT	.7220
NOX CONCENTRATION PPM	43.94
HC MASS GRAMS	7.683
CO MASS GRAMS	.237
CO2 MASS GRAMS	11419.20
NOX MASS GRAMS	71.031
FUEL KG (LB)	3.595 (7.93)
KW HR (HP HR)	13.36 (17.92)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.575(	.429) (	.43)	(CONT)
BSCO G/KW HR (G/HP HR)	.018(	.013) (	.01)	
BSNOX G/KW HR (G/HP HR)	5.316(	3.964) (	3.96)	(CONT)
PART. G/KW HR (G/HP HR)	.223(	.167) (	.17)	
BSFC KG/KW HR (LB/HP HR)	.269(	.442)		
WORK KW HR (HP HR)	13.36(	17.92)		
BSCO2 G/KW HR (G/HP HR)	855. (	637.)		

90 MM FILTER NUMBERS	P90-45	P90-46
90 MM FILTER WT. GAINS (MG)	2.436	.089
PARTICULATE GRAMS/TEST	2.984	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-23 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 9/94 TIME 1:53	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 740.2 MM HG (29.14 IN HG)	CVS: 81.0°F RH 55.0 PCT AH 89.4 GR/LB	ENGINE DEW PT. 10.9°C (51.7°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 8.4 G/KG (58.7 GR/LB)	NOX HUMIDITY C.F. .959
		DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	42.91 (1515.3)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.21)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	864.1 (30510.)
HC SAMPLE METER/RANGE/PPM	12.8/ 12/ 12.83
HC BCKGRD METER/RANGE/PPM	6.0/ 12/ 6.00
CO SAMPLE METER/RANGE/PPM	28.8/ 13/ 26.14
CO BCKGRD METER/RANGE/PPM	.4/ 13/ .35
CO2 SAMPLE METER/RANGE/PCT	82.4/ 11/ .7413
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 52.27
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .42
DILUTION FACTOR	18.27
HC CONCENTRATION PPM	7.16
CO CONCENTRATION PPM	24.99
CO2 CONCENTRATION PCT	.6986
NOX CONCENTRATION PPM	50.47
HC MASS GRAMS	3.551
CO MASS GRAMS	25.135
CO2 MASS GRAMS	11042.52
NOX MASS GRAMS	80.003
FUEL KG (LB)	3.485 (7.68)
KW HR (HP HR)	13.32 (17.86)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.267(.199) (.20) (CONT)	90 MM FILTER NUMBERS P90-47 P90-48
BSCO G/KW HR (G/HP HR)	1.887(1.407) (1.41)	90 MM FILTER WT. GAINS (MG) 2.446 .109
BSNOX G/KW HR (G/HP HR)	6.007(4.479) (4.48) (CONT)	PARTICULATE GRAMS/TEST 3.208
PART. G/KW HR (G/HP HR)	.241(.180) (.18)	
BSFC KG/KW HR (LB/HP HR)	.262(.430)	
WORK KW HR (HP HR)	13.32(17.86)	
BSCO2 G/KW HR (G/HP HR)	829. (618.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) I-6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JH-A-24FI RUN
DATE 5/ 9/94 TIME 3:38
COMPUTER PROGRAM HDT 3.1-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1749-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 739.6 MM HG (29.12 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 81.0°F RH 55.0 PCT AH 89.4 GR/LB
ENGINE ABS. HUM. 9.0 G/KG (62.8 GR/LB)

ENGINE DEW PT. 11.9°C (53.5°F)
NOX HUMIDITY C.F. .969
DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	42.96 (1516.8)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.21)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	864.9 (30539.)
HC SAMPLE METER/RANGE/PPM	1.0/ 15/ 10.14
HC BCKGRD METER/RANGE/PPM	.4/ 15/ 4.00
CO SAMPLE METER/RANGE/PPM	.9/ 13/ .79
CO BCKGRD METER/RANGE/PPM	.2/ 13/ .17
CO2 SAMPLE METER/RANGE/PCT	85.1/ 11/ .7774
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.98
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	17.49
HC CONCENTRATION PPM	6.37
CO CONCENTRATION PPM	.60
CO2 CONCENTRATION PCT	.7360
NOX CONCENTRATION PPM	46.18
HC MASS GRAMS	3.165
CO MASS GRAMS	.603
CO2 MASS GRAMS	11644.50
NOX MASS GRAMS	74.038
FUEL KG (LB)	3.662 (8.07)
KW HR (HP HR)	13.27 (17.79)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.239(	.178) (	.18)	(CONT)
BSCO G/KW HR (G/HP HR)	.045(	.034) (	.03)	
BSNOX G/KW HR (G/HP HR)	5.581(	4.162) (	4.16)	(CONT)
PART. G/KW HR (G/HP HR)	.269(	.201) (	.20)	
BSFC KG/KW HR (LB/HP HR)	.276(	.454)		
WORK KW HR (HP HR)	13.27(	17.79)		
BSCO2 G/KW HR (G/HP HR)	878. (	655.)		

90 MM FILTER NUMBERS	P90-49	P90-50
90 MM FILTER WT. GAINS (MG)	2.788	.061
PARTICULATE GRAMS/TEST	3.572	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM-B-25FI RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/ 9/94 TIME 4:18	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 739.1 MM HG (29.10 IN HG)	CVS: 81.0°F RH 55.0 PCT AH 89.5 GR/LB	ENGINE DEW PT. 11.9°C (53.4°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 8.9 G/KG (62.6 GR/LB)	NOX HUMIDITY C.F. .969
		DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	42.85 (1513.0)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.23)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	862.4 (30453.)
HC SAMPLE METER/RANGE/PPM	1.0/ 15/ 9.91
HC BCKGRD METER/RANGE/PPM	.4/ 15/ 4.00
CO SAMPLE METER/RANGE/PPM	.8/ 13/ .70
CO BCKGRD METER/RANGE/PPM	.1/ 13/ .09
CO2 SAMPLE METER/RANGE/PCT	84.9/ 11/ .7747
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.51
NOX BCKGRD METER/RANGE/PPM	.9/ 2/ .93
DILUTION FACTOR	17.55
HC CONCENTRATION PPM	6.13
CO CONCENTRATION PPM	.60
CO2 CONCENTRATION PCT	.7321
NOX CONCENTRATION PPM	46.31
HC MASS GRAMS	3.039
CO MASS GRAMS	.598
CO2 MASS GRAMS	11550.39
NOX MASS GRAMS	73.993
FUEL KG (LB)	3.632 (8.01)
KW HR (HP HR)	13.29 (17.82)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.229(.171) (.17) (CONT)	90 MM FILTER NUMBERS	P90-51	P90-52
BSCO G/KW HR (G/HP HR)	.045(.034) (.03)	90 MM FILTER WT. GAINS (MG)	3.130	.075
BSNOX G/KW HR (G/HP HR)	5.568(4.152) (4.15) (CONT)	PARTICULATE GRAMS/TEST	3.933	
PART. G/KW HR (G/HP HR)	.296(.221) (.22)			
BSFC KG/KW HR (LB/HP HR)	.273(.449)			
WORK KW HR (HP HR)	13.29(17.82)			
BSCO2 G/KW HR (G/HP HR)	869. (648.)			

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM-C-26FI RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/10/94 TIME	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 742.4 MM HG (29.23 IN HG)	CVS: 81.0°F RH 58.0 PCT AH 94.6 GR/LB	ENGINE DEW PT. 11.9°C (53.5°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 8.9 G/KG (62.6 GR/LB)	NOX HUMIDITY C.F. .969
		DRY-TO-WET C.F. .972

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.0
TOT. BLOWER RATE SCMM (SCFM)	43.21 (1525.6)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.22)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	869.9 (30715.)
HC SAMPLE METER/RANGE/PPM	2.1/ 15/ 20.64
HC BCKGRD METER/RANGE/PPM	.6/ 15/ 6.00
CO SAMPLE METER/RANGE/PPM	1.5/ 13/ 1.31
CO BCKGRD METER/RANGE/PPM	.0/ 13/ .00
CO2 SAMPLE METER/RANGE/PCT	83.0/ 11/ .7492
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.66
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	18.11
HC CONCENTRATION PPM	14.97
CO CONCENTRATION PPM	1.27
CO2 CONCENTRATION PCT	.7065
NOX CONCENTRATION PPM	42.91
HC MASS GRAMS	7.482
CO MASS GRAMS	1.284
CO2 MASS GRAMS	11243.36
NOX MASS GRAMS	69.149
FUEL KG (LB)	3.540 (7.80)
KW HR (HP HR)	13.39 (17.96)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.559(.417)	(.42)	(CONT)	
BSCO G/KW HR (G/HP HR)	.096(.072)	(.07)		
BSNOX G/KW HR (G/HP HR)	5.163(3.850)	(3.85)	(CONT)	
PART. G/KW HR (G/HP HR)	.229(.171)	(.17)		
BSFC KG/KW HR (LB/HP HR)	.264(.435)			
WORK KW HR (HP HR)	13.39(17.96)			
BSCO2 G/KW HR (G/HP HR)	840. (626.)			

90 MM FILTER NUMBERS	P90-53	P90-54
90 MM FILTER WT. GAINS (MG)	2.348	.104
PARTICULATE GRAMS/TEST	3.066	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-27 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/10/94 TIME	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 742.2 MM HG (29.22 IN HG)	CVS: 82.0°F RH 55.0 PCT AH 92.9 GR/LB	ENGINE DEW PT. 10.3°C (50.6°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 8.0 G/KG (56.2 GR/LB)	NOX HUMIDITY C.F. .953
		DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.4
TOT. BLOWER RATE SCMM (SCFM)	43.10 (1521.9)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.26)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.4 (30627.)
HC SAMPLE METER/RANGE/PPM	12.0/ 12/ 12.01
HC BCKGRD METER/RANGE/PPM	5.5/ 12/ 5.50
CO SAMPLE METER/RANGE/PPM	26.8/ 13/ 24.26
CO BCKGRD METER/RANGE/PPM	.2/ 13/ .17
CO2 SAMPLE METER/RANGE/PCT	79.7/ 11/ .7062
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 50.97
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .62
DILUTION FACTOR	19.18
HC CONCENTRATION PPM	6.80
CO CONCENTRATION PPM	23.34
CO2 CONCENTRATION PCT	.6646
NOX CONCENTRATION PPM	48.98
HC MASS GRAMS	3.387
CO MASS GRAMS	23.565
CO2 MASS GRAMS	10544.92
NOX MASS GRAMS	77.454
FUEL KG (LB)	3.328 (7.34)
KW HR (HP HR)	13.40 (17.97)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.253(.188) (.19) (CONT)
BSCO G/KW HR (G/HP HR)	1.759(1.311) (1.31)
BSNOX G/KW HR (G/HP HR)	5.780(4.310) (4.31) (CONT)
PART. G/KW HR (G/HP HR)	.222(.165) (.17)
BSFC KG/KW HR (LB/HP HR)	.248(.408)
WORK KW HR (HP HR)	13.40(17.97)
BSCO2 G/KW HR (G/HP HR)	787. (587.)

90 MM FILTER NUMBERS	P90-55	P90-56
90 MM FILTER WT. GAINS (MG)	2.360	.101
PARTICULATE GRAMS/TEST	2.969	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-B-28 RUN	DIESEL 2D EM-1749-F
ENGINE MODEL 93 CATERPILAR3116	DATE 5/10/94 TIME 2:26	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) I-6	COMPUTER PROGRAM HDT 3.1-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 742.2 MM HG (29.22 IN HG)	CVS: 80.0°F RH 65.0 PCT AH 102.0 GR/LB	ENGINE DEW PT. 11.2°C (52.1°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 8.5 G/KG (59.4 GR/LB)	NOX HUMIDITY C.F. .961
		DRY-TO-WET C.F. .970

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.9
TOT. BLOWER RATE SCMM (SCFM)	43.10 (1521.7)
TOT. 90MM RATE SCMM (SCFM)	.04 (1.30)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.6 (30636.)
HC SAMPLE METER/RANGE/PPM	12.3/ 12/ 12.27
HC BCKGRD METER/RANGE/PPM	6.0/ 12/ 6.00
CO SAMPLE METER/RANGE/PPM	27.1/ 13/ 24.54
CO BCKGRD METER/RANGE/PPM	.3/ 13/ .26
CO2 SAMPLE METER/RANGE/PCT	80.5/ 11/ .7165
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 51.61
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .52
DILUTION FACTOR	18.90
HC CONCENTRATION PPM	6.59
CO CONCENTRATION PPM	23.45
CO2 CONCENTRATION PCT	.6737
NOX CONCENTRATION PPM	49.59
HC MASS GRAMS	3.282
CO MASS GRAMS	23.687
CO2 MASS GRAMS	10693.49
NOX MASS GRAMS	79.082
FUEL KG (LB)	3.374 (7.44)
KW HR (HP HR)	13.39 (17.95)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.245(.183) (.18) (CONT)	90 MM FILTER NUMBERS	P90-57	P90-58
BSCO G/KW HR (G/HP HR)	1.770(1.320) (1.32)	90 MM FILTER WT. GAINS (MG)	2.550	.112
BSNOX G/KW HR (G/HP HR)	5.908(4.406) (4.41) (CONT)	PARTICULATE GRAMS/TEST	3.114	
PART. G/KW HR (G/HP HR)	.233(.173) (.17)			
BSFC KG/KW HR (LB/HP HR)	.252(.414)			
WORK KW HR (HP HR)	13.39(17.95)			
BSCO2 G/KW HR (G/HP HR)	799. (596.)			

APPENDIX D

HOT-START FTP TEST SHEETS
FOR
CATALYST GROUP "B'
FTP TESTS -30 THROUGH -81

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-30 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/ 6/95 TIME 12:40	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 737.9 MM HG (29.05 IN HG)	CVS: 75.0°F RH 41.0 PCT AH 54.8 GR/LB	ENGINE DEW PT. 13.6°C (56.4°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 10.0 G/KG (70.1 GR/LB)	NOX HUMIDITY C.F. .987
		DRY-TO-WET C.F. .981

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.5
TOT. BLOWER RATE SCMM (SCFM)	43.29 (1528.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.10)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	871.8 (30783.)
HC SAMPLE METER/RANGE/PPM	13.0/ 12/ 13.00
HC BCKGRD METER/RANGE/PPM	3.9/ 12/ 3.90
CO SAMPLE METER/RANGE/PPM	25.2/ 12/ 24.42
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	79.9/ 11/ .7088
CO2 BCKGRD METER/RANGE/PCT	7.9/ 11/ .0464
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.79
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	19.11
HC CONCENTRATION PPM	9.31
CO CONCENTRATION PPM	23.77
CO2 CONCENTRATION PCT	.6648
NOX CONCENTRATION PPM	47.21
HC MASS GRAMS	4.660
CO MASS GRAMS	24.126
CO2 MASS GRAMS	10602.69
NOX MASS GRAMS	77.710
FUEL KG (LB)	3.347 (7.38)
KW HR (HP HR)	13.20 (17.70)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.353(.263) (.26) (CONT)	
BSCO G/KW HR (G/HP HR)	1.828(1.363) (1.36)	
BSNOX G/KW HR (G/HP HR)	5.888(4.390) (4.39) (CONT)	
PART. G/KW HR (G/HP HR)	.231(.172) (.17)	
BSFC KG/KW HR (LB/HP HR)	.254(.417)	
WORK KW HR (HP HR)	13.20(17.70)	
BSCO2 G/KW HR (G/HP HR)	803. (599.)	

90 MM FILTER NUMBERS	P90-1	P90-2
90 MM FILTER WT. GAINS (MG)	2.062	.124
PARTICULATE GRAMS/TEST	3.052	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST 300-B-31 RUN
DATE 1/ 6/95 TIME 1:20
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 736.6 MM HG (29.00 IN HG)
ENGINE AIR TEMP. 22.8°C (73.0°F)

CVS: 77.0°F RH 36.0 PCT AH 51.6 GR/LB
ENGINE ABS. HUM. 10.0 G/KG (69.7 GR/LB)

ENGINE DEW PT. 13.4°C (56.2°F)
NOX HUMIDITY C.F. .986
DRY-TO-WET C.F. .982

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.6
TOT. BLOWER RATE SCMM (SCFM)	43.20 (1525.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.08)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	869.4 (30700.)
HC SAMPLE METER/RANGE/PPM	13.8/ 12/ 13.81
HC BCKGRD METER/RANGE/PPM	4.6/ 12/ 4.60
CO SAMPLE METER/RANGE/PPM	25.8/ 12/ 25.02
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	80.5/ 11/ .7165
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.95
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	18.90
HC CONCENTRATION PPM	9.45
CO CONCENTRATION PPM	24.29
CO2 CONCENTRATION PCT	.6737
NOX CONCENTRATION PPM	47.49
HC MASS GRAMS	4.722
CO MASS GRAMS	24.591
CO2 MASS GRAMS	10715.74
NOX MASS GRAMS	77.887
FUEL KG (LB)	3.383 (7.46)
KW HR (HP HR)	13.18 (17.68)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	.358(	.267) (	.27) (CONT)
BSCO	G/KW HR (G/HP HR)	1.865(	1.391) (	1.39)
BSNOX	G/KW HR (G/HP HR)	5.908(	4.405) (	4.41) (CONT)
PART.	G/KW HR (G/HP HR)	.234(	.174) (	.17)
BSFC	KG/KW HR (LB/HP HR)	.257(	.422)	
WORK	KW HR (HP HR)	13.18(	17.68)	
BSCO2	G/KW HR (G/HP HR)	813. (	606.)	

90 MM FILTER NUMBERS	P90-3	P90-4
90 MM FILTER WT. GAINS (MG)	2.058	.116
PARTICULATE GRAMS/TEST	3.085	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM1-A-32-FI RUN
DATE 1/12/95 TIME 11:20
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.6 MM HG (29.04 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 75.0°F RH 66.0 PCT AH 89.1 GR/LB
ENGINE ABS. HUM. 13.0 G/KG (90.7 GR/LB)

ENGINE DEW PT. 17.5°C (63.5°F)
NOX HUMIDITY C.F. 1.043
DRY-TO-WET C.F. .973
New Exhaust System

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	43.19 (1525.1)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.10)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	869.1 (30689.)
HC SAMPLE METER/RANGE/PPM	5.6/ 14/ 28.01
HC BCKGRD METER/RANGE/PPM	.7/ 14/ 3.50
CO SAMPLE METER/RANGE/PPM	3.7/ 12/ 3.51
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	80.4/ 11/ .7152
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 40.92
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .80
DILUTION FACTOR	18.95
HC CONCENTRATION PPM	24.70
CO CONCENTRATION PPM	3.12
CO2 CONCENTRATION PCT	.6730
NOX CONCENTRATION PPM	39.07
HC MASS GRAMS	12.329
CO MASS GRAMS	3.159
CO2 MASS GRAMS	10700.69
NOX MASS GRAMS	67.709
FUEL KG (LB)	3.376 (7.44)
KW HR (HP HR)	13.10 (17.57)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.941(	.702)	(.70)	(CONT)
BSCO G/KW HR (G/HP HR)	.241(	.180)	(.18)	
BSNOX G/KW HR (G/HP HR)	5.168(	3.854)	(3.85)	(CONT)
PART. G/KW HR (G/HP HR)	.227(	.170)	(.17)	
BSFC KG/KW HR (LB/HP HR)	.258(	.424)		
WORK KW HR (HP HR)	13.10(	17.57)		
BSCO2 G/KW HR (G/HP HR)	817. (	609.)		

90 MM FILTER NUMBERS	P90-5	P90-6
90 MM FILTER WT. GAINS (MG)	2.064	.089
PARTICULATE GRAMS/TEST	2.980	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM1-B-33-FC RUN
DATE 1/12/95 TIME 12:00
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.4 MM HG (29.03 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 77.0°F RH 56.0 PCT AH 80.5 GR/LB
ENGINE ABS. HUM. 12.4 G/KG (86.9 GR/LB)

ENGINE DEW PT. 16.8°C (62.3°F)
NOX HUMIDITY C.F. 1.032
DRY-TO-WET C.F. .975

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.4
TOT. BLOWER RATE SCMM (SCFM)	43.12 (1522.4)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.02)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.2 (30657.)
HC SAMPLE METER/RANGE/PPM	5.1/ 14/ 25.49
HC BCKGRD METER/RANGE/PPM	1.0/ 14/ 5.00
CO SAMPLE METER/RANGE/PPM	3.4/ 12/ 3.22
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	82.7/ 11/ .7452
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 41.88
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .80
DILUTION FACTOR	18.19
HC CONCENTRATION PPM	20.76
CO CONCENTRATION PPM	3.03
CO2 CONCENTRATION PCT	.7037
NOX CONCENTRATION PPM	40.08
HC MASS GRAMS	10.352
CO MASS GRAMS	3.063
CO2 MASS GRAMS	11177.39
NOX MASS GRAMS	68.673
FUEL KG (LB)	3.523 (7.77)
KW HR (HP HR)	13.10 (17.57)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.790(	.589) (	.59)	(CONT)
BSCO G/KW HR (G/HP HR)	.234(	.174) (	.17)	
BSNOX G/KW HR (G/HP HR)	5.241(	3.909) (	3.91)	(CONT)
PART. G/KW HR (G/HP HR)	.241(	.179) (	.18)	
BSFC KG/KW HR (LB/HP HR)	.269(	.442)		
WORK KW HR (HP HR)	13.10(	17.57)		
BSCO2 G/KW HR (G/HP HR)	853. (	636.)		

90 MM FILTER NUMBERS	P90-7	P90-8
90 MM FILTER WT. GAINS (MG)	2.037	.079
PARTICULATE GRAMS/TEST	3.152	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM1-C-34-FC RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/12/95 TIME 12:40	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 736.9 MM HG (29.01 IN HG)	CVS: 77.0°F RH 56.0 PCT AH 80.6 GR/LB	ENGINE DEW PT. 16.3°C (61.3°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 12.0 G/KG (83.9 GR/LB)	NOX HUMIDITY C.F. 1.024
		DRY-TO-WET C.F. .975

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.2
TOT. BLOWER RATE SCMM (SCFM)	43.16 (1524.0)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.01)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	869.0 (30683.)
HC SAMPLE METER/RANGE/PPM	4.3/ 14/ 21.55
HC BCKGRD METER/RANGE/PPM	1.0/ 14/ 5.00
CO SAMPLE METER/RANGE/PPM	3.2/ 12/ 3.03
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	82.8/ 11/ .7466
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 42.32
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .80
DILUTION FACTOR	18.17
HC CONCENTRATION PPM	16.82
CO CONCENTRATION PPM	2.85
CO2 CONCENTRATION PCT	.7039
NOX CONCENTRATION PPM	40.51
HC MASS GRAMS	8.396
CO MASS GRAMS	2.879
CO2 MASS GRAMS	11189.59
NOX MASS GRAMS	68.907
FUEL KG (LB)	3.525 (7.77)
KW HR (HP HR)	13.09 (17.56)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.641(.478) (.48) (CONT)	90 MM FILTER NUMBERS P90-9 P90-10
BSCO G/KW HR (G/HP HR)	.220(.164) (.16)	90 MM FILTER WT. GAINS (MG) 2.106 .067
BSNOX G/KW HR (G/HP HR)	5.262(3.924) (3.92) (CONT)	PARTICULATE GRAMS/TEST 3.295
PART. G/KW HR (G/HP HR)	.252(.188) (.19)	
BSFC KG/KW HR (LB/HP HR)	.269(.443)	
WORK KW HR (HP HR)	13.09(17.56)	
BSCO2 G/KW HR (G/HP HR)	855. (637.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM1-D-35 RUN
DATE 1/12/95 TIME 1:20
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 736.1 MM HG (28.98 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 77.0°F RH 56.0 PCT AH 80.7 GR/LB
ENGINE ABS. HUM. 12.2 G/KG (85.2 GR/LB)

ENGINE DEW PT. 16.5°C (61.7°F)
NOX HUMIDITY C.F. 1.027
DRY-TO-WET C.F. .975

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.9
TOT. BLOWER RATE SCMM (SCFM)	43.12 (1522.4)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.01)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.9 (30644.)
HC SAMPLE METER/RANGE/PPM	3.4/ 12/ 3.44
HC BCKGRD METER/RANGE/PPM	3.9/ 12/ 3.90
CO SAMPLE METER/RANGE/PPM	.9/ 12/ .85
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	79.5/ 11/ .7036
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.75
NOX BCKGRD METER/RANGE/PPM	1.1/ 2/ 1.10
DILUTION FACTOR	19.33
HC CONCENTRATION PPM	-.26
CO CONCENTRATION PPM	.65
CO2 CONCENTRATION PCT	.6608
NOX CONCENTRATION PPM	44.55
HC MASS GRAMS	.000
CO MASS GRAMS	.654
CO2 MASS GRAMS	10491.40
NOX MASS GRAMS	75.962
FUEL KG (LB)	3.296 (7.27)
KW HR (HP HR)	13.11 (17.58)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(.000) (.00) (CONT)	
BSCO G/KW HR (G/HP HR)	.050(.037) (.04)	
BSNOX G/KW HR (G/HP HR)	5.794(4.321) (4.32) (CONT)	
PART. G/KW HR (G/HP HR)	.207(.154) (.15)	
BSFC KG/KW HR (LB/HP HR)	.251(.413)	
WORK KW HR (HP HR)	13.11(17.58)	
BSCO2 G/KW HR (G/HP HR)	800. (597.)	

90 MM FILTER NUMBERS	P90-11	P90-12
90 MM FILTER WT. GAINS (MG)	1.746	.052
PARTICULATE GRAMS/TEST	2.713	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-36 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/12/95 TIME 3:28	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 734.1 MM HG (28.90 IN HG)	CVS: 79.0°F RH 54.0 PCT AH 82.8 GR/LB	ENGINE DEW PT. 17.8°C (64.1°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 13.3 G/KG (93.1 GR/LB)	NOX HUMIDITY C.F. 1.050
		DRY-TO-WET C.F. .975

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	42.92 (1515.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	864.1 (30510.)
HC SAMPLE METER/RANGE/PPM	16.1/ 12/ 16.06
HC BCKGRD METER/RANGE/PPM	4.2/ 12/ 4.20
CO SAMPLE METER/RANGE/PPM	26.0/ 12/ 25.21
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	78.7/ 11/ .6935
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.56
NOX BCKGRD METER/RANGE/PPM	1.0/ 2/ 1.00
DILUTION FACTOR	19.51
HC CONCENTRATION PPM	12.08
CO CONCENTRATION PPM	24.44
CO2 CONCENTRATION PCT	.6518
NOX CONCENTRATION PPM	45.42
HC MASS GRAMS	5.994
CO MASS GRAMS	24.588
CO2 MASS GRAMS	10302.75
NOX MASS GRAMS	78.769
FUEL KG (LB)	3.255 (7.18)
KW HR (HP HR)	13.11 (17.58)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.457(.341) (.34) (CONT)	90 MM FILTER NUMBERS	P90-13	P90-14
BSCO G/KW HR (G/HP HR)	1.876(1.399) (1.40)	90 MM FILTER WT. GAINS (MG)	2.086	.124
BSNOX G/KW HR (G/HP HR)	6.009(4.481) (4.48) (CONT)	PARTICULATE GRAMS/TEST	3.360	
PART. G/KW HR (G/HP HR)	.256(.191) (.19)			
BSFC KG/KW HR (LB/HP HR)	.248(.408)			
WORK KW HR (HP HR)	13.11(17.58)			
BSCO2 G/KW HR (G/HP HR)	786. (586.)			

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST AS1-A-37 RUN
DATE 1/13/95 TIME 2:23
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.1 MM HG (29.02 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 77.0°F RH 24.0 PCT AH 34.3 GR/LB
ENGINE ABS. HUM. 11.6 G/KG (81.5 GR/LB)

ENGINE DEW PT. 15.8°C (60.5°F)
NOX HUMIDITY C.F. 1.017
DRY-TO-WET C.F. .986

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.04 (1519.8)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.09)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	866.2 (30587.)
HC SAMPLE METER/RANGE/PPM	7.0/ 12/ 6.98
HC BCKGRD METER/RANGE/PPM	2.8/ 12/ 2.80
CO SAMPLE METER/RANGE/PPM	9.5/ 12/ 9.07
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	78.6/ 11/ .6922
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.23
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	19.62
HC CONCENTRATION PPM	4.33
CO CONCENTRATION PPM	8.79
CO2 CONCENTRATION PCT	.6546
NOX CONCENTRATION PPM	47.27
HC MASS GRAMS	2.152
CO MASS GRAMS	8.869
CO2 MASS GRAMS	10372.76
NOX MASS GRAMS	79.644
FUEL KG (LB)	3.265 (7.20)
KW HR (HP HR)	13.11 (17.58)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.164(	.122) (	.12)	(CONT)
BSCO G/KW HR (G/HP HR)	.677(	.504) (	.50)	
BSNOX G/KW HR (G/HP HR)	6.075(	4.530) (	4.53)	(CONT)
PART. G/KW HR (G/HP HR)	.225(	.168) (	.17)	
BSFC KG/KW HR (LB/HP HR)	.249(	.409)		
WORK KW HR (HP HR)	13.11(	17.58)		
BSCO2 G/KW HR (G/HP HR)	791. (	590.)		

90 MM FILTER NUMBERS	P90-15	P90-16
90 MM FILTER WT. GAINS (MG)	2.064	.040
PARTICULATE GRAMS/TEST	2.946	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST AS1-B-38Fi RUN
DATE 1/13/95 TIME 3:03
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.1 MM HG (29.02 IN HG)
ENGINE AIR TEMP. 22.8°C (73.0°F)

CVS: 79.0°F RH 20.0 PCT AH 31.0 GR/LB
ENGINE ABS. HUM. 11.5 G/KG (80.3 GR/LB)

ENGINE DEW PT. 15.6°C (60.1°F)
NOX HUMIDITY C.F. 1.014
DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.2
TOT. BLOWER RATE SCMM (SCFM)	43.12 (1522.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.10)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.1 (30654.)
HC SAMPLE METER/RANGE/PPM	32.3/ 14/ 161.48
HC BCKGRD METER/RANGE/PPM	.3/ 14/ 1.50
CO SAMPLE METER/RANGE/PPM	14.6/ 12/ 14.02
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	79.6/ 11/ .7049
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 45.82
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	18.84
HC CONCENTRATION PPM	160.06
CO CONCENTRATION PPM	13.48
CO2 CONCENTRATION PCT	.6662
NOX CONCENTRATION PPM	44.73
HC MASS GRAMS	79.817
CO MASS GRAMS	13.619
CO2 MASS GRAMS	10580.61
NOX MASS GRAMS	75.303
FUEL KG (LB)	3.410 (7.52)
KW HR (HP HR)	13.13 (17.61)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	6.078(4.532) (4.53)	(CONT)
BSCO G/KW HR (G/HP HR)	1.037(.773) (.77)	
BSNOX G/KW HR (G/HP HR)	5.734(4.276) (4.28)	(CONT)
PART. G/KW HR (G/HP HR)	.705(.526) (.53)	
BSFC KG/KW HR (LB/HP HR)	.260(.427)	
WORK KW HR (HP HR)	13.13(17.61)	
BSCO2 G/KW HR (G/HP HR)	806. (601.)	

90 MM FILTER NUMBERS	P90-17	P90-18
90 MM FILTER WT. GAINS (MG)	5.904	.769
PARTICULATE GRAMS/TEST	9.255	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST AS3-A-39 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/16/95 TIME	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 738.4 MM HG (29.07 IN HG)	CVS: 76.0°F RH 52.0 PCT AH 72.0 GR/LB	ENGINE DEW PT. 17.3°C (63.1°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 12.8 G/KG (89.3 GR/LB)	NOX HUMIDITY C.F. 1.039
		DRY-TO-WET C.F. .977

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.4
TOT. BLOWER RATE SCMM (SCFM)	43.18 (1524.6)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.06)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.8 (30677.)
HC SAMPLE METER/RANGE/PPM	7.1/ 12/ 7.15
HC BCKGRD METER/RANGE/PPM	3.1/ 12/ 3.10
CO SAMPLE METER/RANGE/PPM	11.8/ 12/ 11.30
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	81.0/ 11/ .7230
CO2 BCKGRD METER/RANGE/PCT	7.8/ 11/ .0458
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.62
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	18.78
HC CONCENTRATION PPM	4.22
CO CONCENTRATION PPM	10.87
CO2 CONCENTRATION PCT	.6796
NOX CONCENTRATION PPM	46.85
HC MASS GRAMS	2.104
CO MASS GRAMS	10.991
CO2 MASS GRAMS	10801.63
NOX MASS GRAMS	80.844
FUEL KG (LB)	3.401 (7.50)
KW HR (HP HR)	13.16 (17.65)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.160(	.119) (	.12)	(CONT)
BSCO G/KW HR (G/HP HR)	.835(	.623) (	.62)	
BSNOX G/KW HR (G/HP HR)	6.142(	4.580) (	4.58)	(CONT)
PART. G/KW HR (G/HP HR)	.227(	.169) (	.17)	
BSFC KG/KW HR (LB/HP HR)	.258(	.425)		
WORK KW HR (HP HR)	13.16(	17.65)		
BSCO2 G/KW HR (G/HP HR)	821. (	612.)		

90 MM FILTER NUMBERS	P90-19	P90-20
90 MM FILTER WT. GAINS (MG)	2.008	.071
PARTICULATE GRAMS/TEST	2.990	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST AS3-B-40FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/16/95 TIME	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 737.6 MM HG (29.04 IN HG)	CVS: 77.0°F RH 46.0 PCT AH 65.5 GR/LB	ENGINE DEW PT. 16.4°C (61.5°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 12.1 G/KG (84.4 GR/LB)	NOX HUMIDITY C.F. 1.025
		DRY-TO-WET C.F. .979

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.3
TOT. BLOWER RATE SCMM (SCFM)	43.20 (1525.4)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.05)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	869.8 (30714.)
HC SAMPLE METER/RANGE/PPM	25.0/ 15/ 249.94
HC BCKGRD METER/RANGE/PPM	.7/ 15/ 7.00
CO SAMPLE METER/RANGE/PPM	20.7/ 12/ 19.99
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	80.7/ 11/ .7191
CO2 BCKGRD METER/RANGE/PCT	8.0/ 11/ .0470
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.13
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	18.25
HC CONCENTRATION PPM	243.33
CO CONCENTRATION PPM	19.25
CO2 CONCENTRATION PCT	.6746
NOX CONCENTRATION PPM	45.74
HC MASS GRAMS	121.581
CO MASS GRAMS	19.491
CO2 MASS GRAMS	10735.51
NOX MASS GRAMS	78.007
FUEL KG (LB)	3.504 (7.72)
KW HR (HP HR)	13.18 (17.68)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	9.222(6.877) (6.88) (CONT)	90 MM FILTER NUMBERS P90-23 P90-24
BSCO G/KW HR (G/HP HR)	1.478(1.102) (1.10)	90 MM FILTER WT. GAINS (MG) ***** 1.084
BSNOX G/KW HR (G/HP HR)	5.917(4.412) (4.41) (CONT)	PARTICULATE GRAMS/TEST 18.702
PART. G/KW HR (G/HP HR)	1.419(1.058) (1.06)	
BSFC KG/KW HR (LB/HP HR)	.266(.437)	
WORK KW HR (HP HR)	13.18(17.68)	
BSCO2 G/KW HR (G/HP HR)	814. (607.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-A-41FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/17/95 TIME 11:48	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	
BAROMETER 739.1 MM HG (29.10 IN HG)	CVS: 78.0°F RH 25.0 PCT AH 36.6 GR/LB	ENGINE DEW PT. 15.7°C (60.2°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 11.5 G/KG (80.4 GR/LB)	NOX HUMIDITY C.F. 1.014
		DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	43.24 (1526.6)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.08)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	870.0 (30720.)
HC SAMPLE METER/RANGE/PPM	18.0/ 14/ 89.95
HC BCKGRD METER/RANGE/PPM	.5/ 14/ 2.50
CO SAMPLE METER/RANGE/PPM	6.8/ 12/ 6.47
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	80.2/ 11/ .7126
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 43.43
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	18.85
HC CONCENTRATION PPM	87.59
CO CONCENTRATION PPM	6.24
CO2 CONCENTRATION PCT	.6739
NOX CONCENTRATION PPM	42.32
HC MASS GRAMS	43.771
CO MASS GRAMS	6.325
CO2 MASS GRAMS	10726.02
NOX MASS GRAMS	71.401
FUEL KG (LB)	3.417 (7.53)
KW HR (HP HR)	13.21 (17.72)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	3.313(2.470) (2.47) (CONT)
BSCO G/KW HR (G/HP HR)	.479(.357) (.36)
BSNOX G/KW HR (G/HP HR)	5.404(4.029) (4.03) (CONT)
PART. G/KW HR (G/HP HR)	.000(.000) (.00)
BSFC KG/KW HR (LB/HP HR)	.259(.425)
WORK KW HR (HP HR)	13.21(17.72)
BSCO2 G/KW HR (G/HP HR)	812. (605.)

90 MM FILTER NUMBERS	NONE	NONE
90 MM FILTER WT. GAINS (MG)	.000	.000
PARTICULATE GRAMS/TEST	~~.000~~	

PARTICULATE DATA NOT AVAILABLE

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-B-42 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/17/95 TIME 12:28	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 738.6 MM HG (29.08 IN HG)	CVS: 78.0°F RH 22.0 PCT AH 32.5 GR/LB	ENGINE DEW PT. 15.8°C (60.5°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 11.6 G/KG (81.3 GR/LB)	NOX HUMIDITY C.F. 1.017
		DRY-TO-WET C.F. .986

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	43.27 (1528.0)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.09)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	870.8 (30748.)
HC SAMPLE METER/RANGE/PPM	5.2/ 12/ 5.16
HC BCKGRD METER/RANGE/PPM	3.2/ 12/ 3.20
CO SAMPLE METER/RANGE/PPM	2.6/ 12/ 2.46
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	79.6/ 11/ .7049
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0385
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.68
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	19.29
HC CONCENTRATION PPM	2.12
CO CONCENTRATION PPM	2.32
CO2 CONCENTRATION PCT	.6685
NOX CONCENTRATION PPM	46.64
HC MASS GRAMS	1.062
CO MASS GRAMS	2.354
CO2 MASS GRAMS	10649.07
NOX MASS GRAMS	78.973
FUEL KG (LB)	3.348 (7.38)
KW HR (HP HR)	13.22 (17.73)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.080(.060) (.06) (CONT)	90 MM FILTER NUMBERS	NONE	NONE
BSCO G/KW HR (G/HP HR)	.178(.133) (.13)	90 MM FILTER WT. GAINS (MG)	.000	.000
BSNOX G/KW HR (G/HP HR)	5.973(4.454) (4.45) (CONT)	PARTICULATE GRAMS/TEST	.000	
PART. G/KW HR (G/HP HR)	.000(.000) (.00)			
BSFC KG/KW HR (LB/HP HR)	.253(.416)			
WORK KW HR (HP HR)	13.22(17.73)			
BSCO2 G/KW HR (G/HP HR)	805. (601.)			

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST 300-A-43 RUN
DATE 1/17/95 TIME 3:11
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 736.9 MM HG (29.01 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 79.0°F RH 20.0 PCT AH 31.0 GR/LB
ENGINE ABS. HUM. 11.1 G/KG (78.0 GR/LB)

ENGINE DEW PT. 15.2°C (59.3°F)
NOX HUMIDITY C.F. 1.008
DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.10 (1521.9)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.05)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.4 (30629.)
HC SAMPLE METER/RANGE/PPM	15.4/ 12/ 15.39
HC BCKGRD METER/RANGE/PPM	3.6/ 12/ 3.60
CO SAMPLE METER/RANGE/PPM	26.5/ 12/ 25.71
CO BCKGRD METER/RANGE/PPM	5.0/ 12/ 4.75
CO2 SAMPLE METER/RANGE/PCT	79.3/ 11/ .7011
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.66
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	19.30
HC CONCENTRATION PPM	11.97
CO CONCENTRATION PPM	20.72
CO2 CONCENTRATION PCT	.6623
NOX CONCENTRATION PPM	47.72
HC MASS GRAMS	5.966
CO MASS GRAMS	20.927
CO2 MASS GRAMS	10510.53
NOX MASS GRAMS	79.798
FUEL KG (LB)	3.318 (7.32)
KW HR (HP HR)	13.21 (17.72)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.451(.337)	(.34)	(CONT)	
BSCO G/KW HR (G/HP HR)	1.584(1.181)	(1.18)		
BSNOX G/KW HR (G/HP HR)	6.039(4.503)	(4.50)	(CONT)	
PART. G/KW HR (G/HP HR)	.000(.000)	(.00)		
BSFC KG/KW HR (LB/HP HR)	.251(.413)			
WORK KW HR (HP HR)	13.21(17.72)			
BSCO2 G/KW HR (G/HP HR)	795. (593.)			

90 MM FILTER NUMBERS	NONE	NONE
90 MM FILTER WT. GAINS (MG)	.000	.000
PARTICULATE GRAMS/TEST	.000	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-B-44 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/17/95 TIME 3:51	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 736.9 MM HG (29.01 IN HG)	CVS: 79.0°F RH 23.0 PCT AH 35.2 GR/LB	ENGINE DEW PT. 15.3°C (59.6°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 11.3 G/KG (78.9 GR/LB)	NOX HUMIDITY C.F. 1.010
		DRY-TO-WET C.F. .986

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.09 (1521.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.08)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.2 (30622.)
HC SAMPLE METER/RANGE/PPM	14.2/ 12/ 14.24
HC BCKGRD METER/RANGE/PPM	3.8/ 12/ 3.80
CO SAMPLE METER/RANGE/PPM	24.9/ 12/ 24.13
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	78.6/ 11/ .6922
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.90
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	19.56
HC CONCENTRATION PPM	10.63
CO CONCENTRATION PPM	23.63
CO2 CONCENTRATION PCT	.6522
NOX CONCENTRATION PPM	47.82
HC MASS GRAMS	5.298
CO MASS GRAMS	23.857
CO2 MASS GRAMS	10348.08
NOX MASS GRAMS	80.125
FUEL KG (LB)	3.268 (7.20)
KW HR (HP HR)	13.19 (17.69)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.402(.299) (.30) (CONT)	90 MM FILTER NUMBERS	NONE	NONE
BSCO G/KW HR (G/HP HR)	1.809(1.349) (1.35)	90 MM FILTER WT. GAINS (MG)	.000	.000
BSNOX G/KW HR (G/HP HR)	6.074(4.529) (4.53) (CONT)	PARTICULATE GRAMS/TEST	.000	
PART. G/KW HR (G/HP HR)	.000(.000) (.00)			
BSFC KG/KW HR (LB/HP HR)	.248(.407)			
WORK KW HR (HP HR)	13.19(17.69)			
BSCO2 G/KW HR (G/HP HR)	784.. (585.)			

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS

PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST DG1-A-45Fi RUN
DATE 1/18/95 TIME 2:07
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 739.6 MM HG (29.12 IN HG)
ENGINE AIR TEMP. 22.8°C (73.0°F)

CVS: 77.0°F RH 24.0 PCT AH 34.0 GR/LB
ENGINE ABS. HUM. 12.9 G/KG (90.5 GR/LB)

ENGINE DEW PT. 17.5°C (63.5°F)
NOX HUMIDITY C.F. 1.042
DRY-TO-WET C.F. .986

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.4
TOT. BLOWER RATE SCMM (SCFM)	43.34 (1530.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.10)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	872.7 (30815.)
HC SAMPLE METER/RANGE/PPM	27.0/ 15/ 269.85
HC BCKGRD METER/RANGE/PPM	.2/ 15/ 2.00
CO SAMPLE METER/RANGE/PPM	32.7/ 12/ 31.85
CO BCKGRD METER/RANGE/PPM	.7/ 12/ .66
CO2 SAMPLE METER/RANGE/PCT	78.3/ 11/ .6884
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.30
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	18.94
HC CONCENTRATION PPM	267.95
CO CONCENTRATION PPM	30.56
CO2 CONCENTRATION PCT	.6508
NOX CONCENTRATION PPM	45.37
HC MASS GRAMS	134.324
CO MASS GRAMS	31.049
CO2 MASS GRAMS	10390.71
NOX MASS GRAMS	78.889
FUEL KG (LB)	3.414 (7.53)
KW HR (HP HR)	13.15 (17.64)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	10.212(7.615) (7.61) (CONT)
BSCO G/KW HR (G/HP HR)	2.360(1.760) (1.76)
BSNOX G/KW HR (G/HP HR)	5.997(4.472) (4.47) (CONT)
PART. G/KW HR (G/HP HR)	1.361(1.015) (1.01)
BSFC KG/KW HR (LB/HP HR)	.260(.427)
WORK KW HR (HP HR)	13.15(17.64)
BSCO2 G/KW HR (G/HP HR)	790. (589.)

90 MM FILTER NUMBERS	P90-25	P90-26
90 MM FILTER WT. GAINS (MG)	*****	1.393
PARTICULATE GRAMS/TEST	17.901	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-A-46FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/18/95 TIME 4:40	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 79.0°F RH 20.0 PCT AH 30.6 GR/LB	ENGINE DEW PT. 15.7°C (60.3°F)
ENGINE AIR TEMP. 21.7°C (71.0°F)	ENGINE ABS. HUM. 11.5 G/KG (80.4 GR/LB)	NOX HUMIDITY C.F. 1.014
		DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.3
TOT. BLOWER RATE SCMM (SCFM)	43.27 (1527.9)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.09)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	871.3 (30766.)
HC SAMPLE METER/RANGE/PPM	20.1/ 15/ 200.79
HC BCKGRD METER/RANGE/PPM	.4/ 15/ 4.00
CO SAMPLE METER/RANGE/PPM	7.9/ 12/ 7.53
CO BCKGRD METER/RANGE/PPM	.7/ 12/ .66
CO2 SAMPLE METER/RANGE/PCT	80.9/ 11/ .7217
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0385
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 43.43
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .10
DILUTION FACTOR	18.33
HC CONCENTRATION PPM	197.01
CO CONCENTRATION PPM	6.76
CO2 CONCENTRATION PCT	.6853
NOX CONCENTRATION PPM	42.75
HC MASS GRAMS	98.602
CO MASS GRAMS	6.854
CO2 MASS GRAMS	10923.75
NOX MASS GRAMS	72.245
FUEL KG (LB)	3.534 (7.79)
KW HR (HP HR)	13.17 (17.66)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	7.487(5.583)	(5.58)	(CONT)	
BSCO G/KW HR (G/HP HR)	.520(.388)	(.39)		
BSNOX G/KW HR (G/HP HR)	5.486(4.091)	(4.09)	(CONT)	
PART. G/KW HR (G/HP HR)	1.065(.794)	(.79)		
BSFC KG/KW HR (LB/HP HR)	.268(.441)			
WORK KW HR (HP HR)	13.17(17.66)			
BSCO2 G/KW HR (G/HP HR)	830. (619.)			

90 MM FILTER NUMBERS	P90-27	P90-28
90 MM FILTER WT. GAINS (MG)	8.741	1.298
PARTICULATE GRAMS/TEST	14.025	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST NP3-A-47FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/19/95 TIME 12:04	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 746.8 MM HG (29.40 IN HG)	CVS: 77.0°F RH 21.0 PCT AH 29.3 GR/LB	ENGINE DEW PT. 17.6°C (63.6°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 12.8 G/KG (89.9 GR/LB)	NOX HUMIDITY C.F. 1.040
		DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.6
TOT. BLOWER RATE SCMM (SCFM)	43.66 (1541.7)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.12)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	878.7 (31025.)
HC SAMPLE METER/RANGE/PPM	8.4/ 14/ 42.05
HC BCKGRD METER/RANGE/PPM	.7/ 14/ 3.50
CO SAMPLE METER/RANGE/PPM	4.2/ 12/ 3.98
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	79.8/ 11/ .7075
CO2 BCKGRD METER/RANGE/PCT	7.1/ 11/ .0415
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.43
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	19.12
HC CONCENTRATION PPM	38.73
CO CONCENTRATION PPM	3.82
CO2 CONCENTRATION PCT	.6682
NOX CONCENTRATION PPM	43.57
HC MASS GRAMS	19.546
CO MASS GRAMS	3.902
CO2 MASS GRAMS	10740.18
NOX MASS GRAMS	76.154
FUEL KG (LB)	3.396 (7.49)
KW HR (HP HR)	13.18 (17.68)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.483(1.106) (1.11) (CONT)
BSCO G/KW HR (G/HP HR)	.296(.221) (.22)
BSNOX G/KW HR (G/HP HR)	5.776(4.307) (4.31) (CONT)
PART. G/KW HR (G/HP HR)	.552(.412) (.41)
BSFC KG/KW HR (LB/HP HR)	.258(.423)
WORK KW HR (HP HR)	13.18(17.68)
BSCO2 G/KW HR (G/HP HR)	815. (607.)

90 MM FILTER NUMBERS	P90-29	P90-30
90 MM FILTER WT. GAINS (MG)	4.582	.721
PARTICULATE GRAMS/TEST	7.278	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM2-A-48 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/23/95 TIME 2:43	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 749.0 MM HG (29.49 IN HG)	CVS: 77.0°F RH 18.0 PCT AH 25.2 GR/LB	ENGINE DEW PT. 9.1°C (48.4°F)
ENGINE AIR TEMP. 21.7°C (71.0°F)	ENGINE ABS. HUM. 7.3 G/KG (51.2 GR/LB)	NOX HUMIDITY C.F. .942
		DRY-TO-WET C.F. .988

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.6
TOT. BLOWER RATE SCMM (SCFM)	43.97 (1552.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.14)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	884.8 (31243.)
HC SAMPLE METER/RANGE/PPM	6.2/ 12/ 6.21
HC BCKGRD METER/RANGE/PPM	31.8/ 12/ 31.81
CO SAMPLE METER/RANGE/PPM	4.5/ 12/ 4.27
CO BCKGRD METER/RANGE/PPM	1.5/ 12/ 1.42
CO2 SAMPLE METER/RANGE/PCT	78.6/ 11/ .6922
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 50.51
NOX BCKGRD METER/RANGE/PPM	.9/ 2/ .90
DILUTION FACTOR	19.63
HC CONCENTRATION PPM	-23.98
CO CONCENTRATION PPM	2.85
CO2 CONCENTRATION PCT	.6493
NOX CONCENTRATION PPM	49.05
HC MASS GRAMS	.000
CO MASS GRAMS	2.938
CO2 MASS GRAMS	10510.77
NOX MASS GRAMS	78.162
FUEL KG (LB)	3.303 (7.28)
KW HR (HP HR)	13.18 (17.68)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(.000) (.00) (CONT)	90 MM FILTER NUMBERS	P90-31	P90-32
BSCO G/KW HR (G/HP HR)	.223(.166) (.17)	90 MM FILTER WT. GAINS (MG)	1.768	.080
BSNOX G/KW HR (G/HP HR)	5.929(4.421) (4.42) (CONT)	PARTICULATE GRAMS/TEST	2.519	
PART. G/KW HR (G/HP HR)	.191(.142) (.14)			
BSFC KG/KW HR (LB/HP HR)	.251(.412)			
WORK KW HR (HP HR)	13.18(17.68)			
BSCO2 G/KW HR (G/HP HR)	797. (595.)			

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM2-B-49-Fi RUN
DATE 1/23/95 TIME
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 748.8 MM HG (29.48 IN HG)
ENGINE AIR TEMP. 21.1°C (70.0°F)

CVS: 77.0°F RH 15.0 PCT AH 21.3 GR/LB
ENGINE ABS. HUM. 7.0 G/KG (49.1 GR/LB)

ENGINE DEW PT. 8.5°C (47.3°F)
NOX HUMIDITY C.F. .937
DRY-TO-WET C.F. .989

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	43.74 (1544.4)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.15)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	880.1 (31078.)
HC SAMPLE METER/RANGE/PPM	16.0/ 12/ 16.01
HC BCKGRD METER/RANGE/PPM	8.3/ 12/ 8.30
CO SAMPLE METER/RANGE/PPM	8.2/ 12/ 7.82
CO BCKGRD METER/RANGE/PPM	1.1/ 12/ 1.04
CO2 SAMPLE METER/RANGE/PCT	81.4/ 11/ .7282
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.50
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	18.63
HC CONCENTRATION PPM	8.15
CO CONCENTRATION PPM	6.69
CO2 CONCENTRATION PCT	.6866
NOX CONCENTRATION PPM	43.42
HC MASS GRAMS	4.122
CO MASS GRAMS	6.859
CO2 MASS GRAMS	11055.08
NOX MASS GRAMS	68.481
FUEL KG (LB)	3.481 (7.67)
KW HR (HP HR)	13.20 (17.70)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	.312(	.233) (	.23) (CONT)
BSCO	G/KW HR (G/HP HR)	.520(	.388) (	.39)
BSNOX	G/KW HR (G/HP HR)	5.188(	3.869) (	3.87) (CONT)
PART.	G/KW HR (G/HP HR)	.283(	.211) (	.21)
BSFC	KG/KW HR (LB/HP HR)	.264(	.434)	
WORK	KW HR (HP HR)	13.20(	17.70)	
BSCO2	G/KW HR (G/HP HR)	838. (	625.)	

90 MM FILTER NUMBERS	P90-33	P90-34
90 MM FILTER WT. GAINS (MG)	2.471	.316
PARTICULATE GRAMS/TEST	3.731	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-50 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/25/95 TIME 11:44	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 749.3 MM HG (29.50 IN HG)	CVS: 73.0°F RH 46.0 PCT AH 56.9 GR/LB	ENGINE DEW PT. 9.0°C (48.2°F)
ENGINE AIR TEMP. 21.1°C (70.0°F)	ENGINE ABS. HUM. 7.3 G/KG (50.8 GR/LB)	NOX HUMIDITY C.F. .941
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.0
TOT. BLOWER RATE SCMM (SCFM)	43.69 (1542.9)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.12)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	879.6 (31060.)
HC SAMPLE METER/RANGE/PPM	13.9/ 12/ 13.95
HC BCKGRD METER/RANGE/PPM	5.0/ 12/ 5.00
CO SAMPLE METER/RANGE/PPM	28.1/ 12/ 27.29
CO BCKGRD METER/RANGE/PPM	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	82.4/ 11/ .7413
CO2 BCKGRD METER/RANGE/PCT	7.9/ 11/ .0464
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 53.94
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	18.26
HC CONCENTRATION PPM	9.22
CO CONCENTRATION PPM	26.06
CO2 CONCENTRATION PCT	.6974
NOX CONCENTRATION PPM	52.41
HC MASS GRAMS	4.661
CO MASS GRAMS	26.683
CO2 MASS GRAMS	11222.84
NOX MASS GRAMS	82.940
FUEL KG (LB)	3.544 (7.81)
KW HR (HP HR)	13.14 (17.62)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.355(.265)	(.26)	(CONT)	
BSCO G/KW HR (G/HP HR)	2.031(1.514)	(1.51)		
BSNOX G/KW HR (G/HP HR)	6.312(4.707)	(4.71)	(CONT)	
PART. G/KW HR (G/HP HR)	.250(.186)	(.19)		
BSFC KG/KW HR (LB/HP HR)	.270(.443)			
WORK KW HR (HP HR)	13.14(17.62)			
BSCO2 G/KW HR (G/HP HR)	854. (637.)			

90 MM FILTER NUMBERS	P90-35	P90-36
90 MM FILTER WT. GAINS (MG)	2.249	.134
PARTICULATE GRAMS/TEST	3.279	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST NP6-A-51F RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 1/25/95 TIME 2:23	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 746.5 MM HG (29.39 IN HG)	CVS: 74.0°F RH 47.0 PCT AH 60.1 GR/LB	ENGINE DEW PT. 9.2°C (48.5°F)
ENGINE AIR TEMP. 21.1°C (70.0°F)	ENGINE ABS. HUM. 7.4 G/KG (51.6 GR/LB)	NOX HUMIDITY C.F. .943
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.52 (1536.6)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.11)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	876.1 (30937.)
HC SAMPLE METER/RANGE/PPM	33.3/ 14/ 166.51
HC BCKGRD METER/RANGE/PPM	5.6/ 12/ 5.60
CO SAMPLE METER/RANGE/PPM	12.8/ 12/ 12.27
CO BCKGRD METER/RANGE/PPM	1.1/ 12/ 1.04
CO2 SAMPLE METER/RANGE/PCT	83.3/ 11/ .7532
CO2 BCKGRD METER/RANGE/PCT	8.5/ 11/ .0501
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 51.30
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	17.65
HC CONCENTRATION PPM	161.22
CO CONCENTRATION PPM	10.94
CO2 CONCENTRATION PCT	.7059
NOX CONCENTRATION PPM	49.59
HC MASS GRAMS	81.140
CO MASS GRAMS	11.162
CO2 MASS GRAMS	11314.65
NOX MASS GRAMS	78.318
FUEL KG (LB)	3.641 (8.03)
KW HR (HP HR)	13.15 (17.63)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	6.172(	4.602)	(4.60)	(CONT)
BSCO G/KW HR (G/HP HR)	.849(	.633)	(.63)	
BSNOX G/KW HR (G/HP HR)	5.957(	4.442)	(4.44)	(CONT)
PART. G/KW HR (G/HP HR)	.787(	.587)	(.59)	
BSFC KG/KW HR (LB/HP HR)	.277(	.455)		
WORK KW HR (HP HR)	13.15(	17.63)		
BSCO2 G/KW HR (G/HP HR)	861. (	642.)		

90 MM FILTER NUMBERS	P90-37	P90-38
90 MM FILTER WT. GAINS (MG)	6.450	1.028
PARTICULATE GRAMS/TEST	10.346	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM1/2-A-52 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/10/95 TIME 11:28	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 737.4 MM HG (29.03 IN HG)	CVS: 79.0°F RH 35.0 PCT AH 52.8 GR/LB	ENGINE DEW PT. 9.8°C (49.6°F)
ENGINE AIR TEMP. 21.1°C (70.0°F)	ENGINE ABS. HUM. 7.8 G/KG (54.4 GR/LB)	NOX HUMIDITY C.F. .949
		DRY-TO-WET C.F. .982

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.2
TOT. BLOWER RATE SCMM (SCFM)	43.30 (1529.0)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.10)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	871.8 (30785.)
HC SAMPLE METER/RANGE/PPM	4.5/ 12/ 4.47
HC BCKGRD METER/RANGE/PPM	6.7/ 12/ 6.70
CO SAMPLE METER/RANGE/PPM	3.0/ 12/ 2.84
CO BCKGRD METER/RANGE/PPM	1.2/ 12/ 1.13
CO2 SAMPLE METER/RANGE/PCT	79.6/ 11/ .7049
CO2 BCKGRD METER/RANGE/PCT	8.7/ 11/ .0514
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 49.35
NOX BCKGRD METER/RANGE/PPM	1.2/ 2/ 1.20
DILUTION FACTOR	19.29
HC CONCENTRATION PPM	-1.88
CO CONCENTRATION PPM	1.71
CO2 CONCENTRATION PCT	.6562
NOX CONCENTRATION PPM	47.31
HC MASS GRAMS	.000
CO MASS GRAMS	1.734
CO2 MASS GRAMS	10466.50
NOX MASS GRAMS	74.869
FUEL KG (LB)	3.289 (7.25)
KW HR (HP HR)	13.25 (17.77)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(.000)	(.00)	(CONT)	
BSCO G/KW HR (G/HP HR)	.131(.098)	(.10)		
BSNOX G/KW HR (G/HP HR)	5.650(4.213)	(4.21)	(CONT)	
PART. G/KW HR (G/HP HR)	.190(.141)	(.14)		
BSFC KG/KW HR (LB/HP HR)	.248(.408)			
WORK KW HR (HP HR)	13.25(17.77)			
BSCO2 G/KW HR (G/HP HR)	790. (589.)			

90 MM FILTER NUMBERS	P90-39	P90-40
90 MM FILTER WT. GAINS (MG)	1.759	.053
PARTICULATE GRAMS/TEST	2.513	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM1/2-B-53FI RUN
DATE 2/10/95 TIME 12:08
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 736.9 MM HG (29.01 IN HG)
ENGINE AIR TEMP. 21.7°C (71.0°F)

CVS: 80.0°F RH 35.0 PCT AH 55.8 GR/LB
ENGINE ABS. HUM. 7.5 G/KG (52.8 GR/LB)

ENGINE DEW PT. 9.3°C (48.8°F)
NOX HUMIDITY C.F. .946
DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	42.90 (1514.8)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.07)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	863.4 (30487.)
HC SAMPLE METER/RANGE/PPM	4.3/ 15/ 43.09
HC BCKGRD METER/RANGE/PPM	6.1/ 12/ 6.10
CO SAMPLE METER/RANGE/PPM	6.0/ 12/ 5.71
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .38
CO2 SAMPLE METER/RANGE/PCT	83.9/ 11/ .7612
CO2 BCKGRD METER/RANGE/PCT	7.3/ 11/ .0427
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 42.09
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	17.77
HC CONCENTRATION PPM	37.33
CO CONCENTRATION PPM	5.21
CO2 CONCENTRATION PCT	.7209
NOX CONCENTRATION PPM	40.79
HC MASS GRAMS	18.515
CO MASS GRAMS	5.233
CO2 MASS GRAMS	11386.74
NOX MASS GRAMS	63.691
FUEL KG (LB)	3.598 (7.93)
KW HR (HP HR)	13.26 (17.78)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.396(1.041) (1.04)	(CONT)
BSCO G/KW HR (G/HP HR)	.395(.294) (.29)	
BSNOX G/KW HR (G/HP HR)	4.804(3.582) (3.58)	(CONT)
PART. G/KW HR (G/HP HR)	.247(.184) (.18)	
BSFC KG/KW HR (LB/HP HR)	.271(.446)	
WORK KW HR (HP HR)	13.26(17.78)	
BSCO2 G/KW HR (G/HP HR)	859. (640.)	

90 MM FILTER NUMBERS	P90-41	P90-42
90 MM FILTER WT. GAINS (MG)	2.233	.083
PARTICULATE GRAMS/TEST	3.277	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM1+2-A-54TI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/14/95 TIME 12:03	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 740.2 MM HG (29.14 IN HG)	CVS: 70.0°F RH 44.0 PCT AH 49.7 GR/LB	ENGINE DEW PT. 10.7°C (51.3°F)
ENGINE AIR TEMP. 21.7°C (71.0°F)	ENGINE ABS. HUM. 8.3 G/KG (57.8 GR/LB)	NOX HUMIDITY C.F. .957
		DRY-TO-WET C.F. .982

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.14 (1523.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.05)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.5 (30665.)
HC SAMPLE METER/RANGE/PPM	3.3/ 15/ 32.81
HC BCKGRD METER/RANGE/PPM	12.0/ 12/ 12.00
CO SAMPLE METER/RANGE/PPM	7.1/ 12/ 6.76
CO BCKGRD METER/RANGE/PPM	1.0/ 12/ .94
CO2 SAMPLE METER/RANGE/PCT	86.5/ 11/ .7965
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0433
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 41.23
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	17.00
HC CONCENTRATION PPM	21.52
CO CONCENTRATION PPM	5.69
CO2 CONCENTRATION PCT	.7557
NOX CONCENTRATION PPM	40.09
HC MASS GRAMS	10.733
CO MASS GRAMS	5.749
CO2 MASS GRAMS	12007.01
NOX MASS GRAMS	63.734
FUEL KG (LB)	3.786 (8.35)
KW HR (HP HR)	13.26 (17.78)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.810(.604) (.60) (CONT)	90 MM FILTER NUMBERS P90-45 P90-46
BSCO G/KW HR (G/HP HR)	.434(.323) (.32)	90 MM FILTER WT. GAINS (MG) 7.092 .407
BSNOX G/KW HR (G/HP HR)	4.807(3.585) (3.58) (CONT)	PARTICULATE GRAMS/TEST 10.925
PART. G/KW HR (G/HP HR)	.824(.614) (.61)	
BSFC KG/KW HR (LB/HP HR)	.286(.469)	
WORK KW HR (HP HR)	13.26(17.78)	TOLUENE SPRAY FAILURE SUSPECTED
BSCO2 G/KW HR (G/HP HR)	906. (675.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-55 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/15/95 TIME	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 736.1 MM HG (28.98 IN HG)	CVS: 79.0°F RH 57.0 PCT AH 87.9 GR/LB	ENGINE DEW PT. 10.2°C (50.4°F)
ENGINE AIR TEMP. 21.7°C (71.0°F)	ENGINE ABS. HUM. 8.0 G/KG (56.2 GR/LB)	NOX HUMIDITY C.F. .953
		DRY-TO-WET C.F. .974

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.3
TOT. BLOWER RATE SCMM (SCFM)	43.20 (1525.4)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	869.8 (30713.)
HC SAMPLE METER/RANGE/PPM	16.0/ 12/ 16.02
HC BCKGRD METER/RANGE/PPM	5.0/ 12/ 5.00
CO SAMPLE METER/RANGE/PPM	24.8/ 12/ 24.03
CO BCKGRD METER/RANGE/PPM	.6/ 12/ .57
CO2 SAMPLE METER/RANGE/PCT	79.3/ 11/ .7011
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 49.77
NOX BCKGRD METER/RANGE/PPM	1.0/ 2/ 1.00
DILUTION FACTOR	19.31
HC CONCENTRATION PPM	11.28
CO CONCENTRATION PPM	22.74
CO2 CONCENTRATION PCT	.6612
NOX CONCENTRATION PPM	47.52
HC MASS GRAMS	5.637
CO MASS GRAMS	23.025
CO2 MASS GRAMS	10520.79
NOX MASS GRAMS	75.354
FUEL KG (LB)	3.322 (7.32)
KW HR (HP HR)	13.20 (17.70)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.427(	.318)	(.32)	(CONT)
BSCO G/KW HR (G/HP HR)	1.744(	1.301)	(1.30)	
BSNOX G/KW HR (G/HP HR)	5.709(	4.257)	(4.26)	(CONT)
PART. G/KW HR (G/HP HR)	.255(	.190)	(.19)	
BSFC KG/KW HR (LB/HP HR)	.252(	.414)		
WORK KW HR (HP HR)	13.20(	17.70)		
BSCO2 G/KW HR (G/HP HR)	797. (	594.)		

90 MM FILTER NUMBERS	P90-47	P90-48
90 MM FILTER WT. GAINS (MG)	2.070	.139
PARTICULATE GRAMS/TEST	3.361	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-56FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/15/95 TIME 2:35	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 735.8 MM HG (28.97 IN HG)	CVS: 78.0°F RH 53.0 PCT AH 79.0 GR/LB	ENGINE DEW PT. 9.7°C (49.5°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 7.8 G/KG (54.3 GR/LB)	NOX HUMIDITY C.F. .949
		DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.11 (1522.1)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.01)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	867.5 (30632.)
HC SAMPLE METER/RANGE/PPM	13.9/ 16/ 692.57
HC BCKGRD METER/RANGE/PPM	4.9/ 12/ 4.90
CO SAMPLE METER/RANGE/PPM	25.1/ 12/ 24.32
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .38
CO2 SAMPLE METER/RANGE/PCT	78.6/ 11/ .6922
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 49.72
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	17.82
HC CONCENTRATION PPM	687.94
CO CONCENTRATION PPM	23.24
CO2 CONCENTRATION PCT	.6542
NOX CONCENTRATION PPM	48.05
HC MASS GRAMS	342.817
CO MASS GRAMS	23.468
CO2 MASS GRAMS	10382.21
NOX MASS GRAMS	75.647
FUEL KG (LB)	3.616 (7.97)
KW HR (HP HR)	13.21 (17.71)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	25.959(19.357) (19.36) (CONT)	90 MM FILTER NUMBERS P90-49 P90-50
BSCO G/KW HR (G/HP HR)	1.777(1.325) (1.33)	90 MM FILTER WT. GAINS (MG) ***** 5.008
BSNOX G/KW HR (G/HP HR)	5.728(4.271) (4.27) (CONT)	PARTICULATE GRAMS/TEST ******
PART. G/KW HR (G/HP HR)	7.617(5.680) (5.68)	
BSFC KG/KW HR (LB/HP HR)	.274(.450)	
WORK KW HR (HP HR)	13.21(17.71)	
BSCO2 G/KW HR (G/HP HR)	786. (586.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-A-57 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/16/95 TIME 3:43	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.2 MM HG (29.18 IN HG)	CVS: 80.0°F RH 38.0 PCT AH 60.0 GR/LB	ENGINE DEW PT. 10.7°C (51.2°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 8.2 G/KG (57.5 GR/LB)	NOX HUMIDITY C.F. .957
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	43.58 (1538.8)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.02)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	876.9 (30964.)
HC SAMPLE METER/RANGE/PPM	4.6/ 12/ 4.62
HC BCKGRD METER/RANGE/PPM	3.9/ 12/ 3.90
CO SAMPLE METER/RANGE/PPM	2.5/ 12/ 2.37
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	77.7/ 11/ .6809
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.64
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	19.97
HC CONCENTRATION PPM	.91
CO CONCENTRATION PPM	2.22
CO2 CONCENTRATION PCT	.6420
NOX CONCENTRATION PPM	47.11
HC MASS GRAMS	.461
CO MASS GRAMS	2.264
CO2 MASS GRAMS	10299.61
NOX MASS GRAMS	75.564
FUEL KG (LB)	3.237 (7.14)
KW HR (HP HR)	13.09 (17.55)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.035(	.026) (	.03)	(CONT)
BSCO G/KW HR (G/HP HR)	.173(	.129) (	.13)	
BSNOX G/KW HR (G/HP HR)	5.774(	4.306) (	4.31)	(CONT)
PART. G/KW HR (G/HP HR)	.243(	.181) (	.18)	
BSFC KG/KW HR (LB/HP HR)	.247(	.407)		
WORK KW HR (HP HR)	13.09(	17.55)		
BSCO2 G/KW HR (G/HP HR)	787. (	587.)		

90 MM FILTER NUMBERS	P90-51	P90-52
90 MM FILTER WT. GAINS (MG)	2.041	.067
PARTICULATE GRAMS/TEST	3.176	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-B-58FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/16/95 TIME 4:23	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.2 MM HG (29.18 IN HG)	CVS: 78.0°F RH 40.0 PCT AH 58.6 GR/LB	ENGINE DEW PT. 10.1°C (50.1°F)
ENGINE AIR TEMP. 21.7°C (71.0°F)	ENGINE ABS. HUM. 7.9 G/KG (55.2 GR/LB)	NOX HUMIDITY C.F. .951
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.9
TOT. BLOWER RATE SCMM (SCFM)	43.37 (1531.3)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.05)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	872.9 (30823.)
HC SAMPLE METER/RANGE/PPM	27.5/ 15/ ~~274.73~~
HC BCKGRD METER/RANGE/PPM	5.0/ 12/ 5.00
CO SAMPLE METER/RANGE/PPM	9.5/ 12/ 9.07
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	81.0/ 11/ .7230
CO2 BCKGRD METER/RANGE/PCT	7.1/ 11/ .0415
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 43.82
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .80
DILUTION FACTOR	18.12
HC CONCENTRATION PPM	~~270.01~~
CO CONCENTRATION PPM	8.83
CO2 CONCENTRATION PCT	.6838
NOX CONCENTRATION PPM	42.19
HC MASS GRAMS	135.391
CO MASS GRAMS	8.975
CO2 MASS GRAMS	10919.45
NOX MASS GRAMS	66.986
FUEL KG (LB)	3.570 (7.87)
KW HR (HP HR)	13.14 (17.62)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	10.304(~~7.684~~) (~~7.68~~) (CONT)	90 MM FILTER NUMBERS P90-53 P90-54
BSCO G/KW HR (G/HP HR)	.683(.509) (.51)	90 MM FILTER WT. GAINS (MG) ***** 1.909
BSNOX G/KW HR (G/HP HR)	5.098(3.802) (3.80) (CONT)	PARTICULATE GRAMS/TEST 22.248
PART. G/KW HR (G/HP HR)	1.693(1.263) (1.26)	
BSFC KG/KW HR (LB/HP HR)	.272(.447)	
WORK KW HR (HP HR)	13.14(17.62)	
BSCO2 G/KW HR (G/HP HR)	831. (620.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-A-59 RUN
DATE 2/20/95 TIME 12:18
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 747.8 MM HG (29.44 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 80.0°F RH 18.0 PCT AH 28.4 GR/LB
ENGINE ABS. HUM. 6.9 G/KG (48.6 GR/LB)

ENGINE DEW PT. 8.3°C (47.0°F)
NOX HUMIDITY C.F. .936
DRY-TO-WET C.F. .988

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.4
TOT. BLOWER RATE SCMM (SCFM)	43.93 (1551.3)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.14)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	884.7 (31240.)
HC SAMPLE METER/RANGE/PPM	4.9/ 12/ 4.92
HC BCKGRD METER/RANGE/PPM	4.6/ 12/ 4.60
CO SAMPLE METER/RANGE/PPM	5.6/ 12/ 5.32
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	75.7/ 11/ .6560
CO2 BCKGRD METER/RANGE/PCT	6.7/ 11/ .0391
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.28
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	20.72
HC CONCENTRATION PPM	.54
CO CONCENTRATION PPM	5.05
CO2 CONCENTRATION PCT	.6188
NOX CONCENTRATION PPM	47.30
HC MASS GRAMS	.272
CO MASS GRAMS	5.197
CO2 MASS GRAMS	10016.40
NOX MASS GRAMS	74.896
FUEL KG (LB)	3.150 (6.94)
KW HR (HP HR)	13.24 (17.75)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.021(	.015) (	.02)	(CONT)
BSCO G/KW HR (G/HP HR)	.393(	.293) (	.29)	
BSNOX G/KW HR (G/HP HR)	5.658(	4.219) (	4.22)	(CONT)
PART. G/KW HR (G/HP HR)	.186(	.138) (	.14)	
BSFC KG/KW HR (LB/HP HR)	.238(	.391)		
WORK KW HR (HP HR)	13.24(	17.75)		
BSCO2 G/KW HR (G/HP HR)	757. (	564.)		

90 MM FILTER NUMBERS	P90-55	P90-56
90 MM FILTER WT. GAINS (MG)	1.724	.072
PARTICULATE GRAMS/TEST	2.456	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-~~A~~B-60FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/20/95 TIME 12:58	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 746.8 MM HG (29.40 IN HG)	CVS: 80.0°F RH 18.0 PCT AH 28.5 GR/LB	ENGINE DEW PT. 8.1°C (46.5°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 6.8 G/KG (47.8 GR/LB)	NOX HUMIDITY C.F. .934
		DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.69 (1542.8)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.17)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	879.4 (31052.)
HC SAMPLE METER/RANGE/PPM	22.7/ 12/ 22.67
HC BCKGRD METER/RANGE/PPM	5.2/ 12/ 5.20
CO SAMPLE METER/RANGE/PPM	9.9/ 12/ 9.46
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	77.9/ 11/ .6834
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.46
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	19.83
HC CONCENTRATION PPM	17.73
CO CONCENTRATION PPM	9.10
CO2 CONCENTRATION PCT	.6451
NOX CONCENTRATION PPM	45.40
HC MASS GRAMS	8.956
CO MASS GRAMS	9.319
CO2 MASS GRAMS	10378.74
NOX MASS GRAMS	71.300
FUEL KG (LB)	3.274 (7.22)
KW HR (HP HR)	13.22 (17.73)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.677(	.505)	(.51)	(CONT)
BSCO G/KW HR (G/HP HR)	.705(	.526)	(.53)	
BSNOX G/KW HR (G/HP HR)	5.393(	4.021)	(4.02)	(CONT)
PART. G/KW HR (G/HP HR)	.426(	.317)	(.32)	
BSFC KG/KW HR (LB/HP HR)	.248(	.407)		
WORK KW HR (HP HR)	13.22(	17.73)		
BSCO2 G/KW HR (G/HP HR)	785. (	585.)		

90 MM FILTER NUMBERS	P90-57	P90-58
90 MM FILTER WT. GAINS (MG)	3.710	.568
PARTICULATE GRAMS/TEST	5.627	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-A-61FTI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/21/95 TIME 11:30	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 747.5 MM HG (29.43 IN HG)	CVS: 81.0°F RH 17.0 PCT AH 26.7 GR/LB	ENGINE DEW PT. 10.7°C (51.2°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 8.1 G/KG (57.0 GR/LB)	NOX HUMIDITY C.F. .955
		DRY-TO-WET C.F. .988

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.2
TOT. BLOWER RATE SCMM (SCFM)	43.79 (1546.3)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.17)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	881.8 (31136.)
HC SAMPLE METER/RANGE/PPM	4.4/ 14/ 22.09
HC BCKGRD METER/RANGE/PPM	4.3/ 12/ 4.30
CO SAMPLE METER/RANGE/PPM	5.4/ 12/ 5.13
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	77.9/ 11/ .6834
CO2 BCKGRD METER/RANGE/PCT	7.1/ 11/ .0415
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.32
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .20
DILUTION FACTOR	19.84
HC CONCENTRATION PPM	18.00
CO CONCENTRATION PPM	5.04
CO2 CONCENTRATION PCT	.6440
NOX CONCENTRATION PPM	47.54
HC MASS GRAMS	9.119
CO MASS GRAMS	5.170
CO2 MASS GRAMS	10388.10
NOX MASS GRAMS	76.583
FUEL KG (LB)	3.275 (7.22)
KW HR (HP HR)	13.16 (17.65)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.693(	.517) (	.52)	(CONT)
BSCO G/KW HR (G/HP HR)	.393(	.293) (	.29)	
BSNOX G/KW HR (G/HP HR)	5.819(	4.339) (	4.34)	(CONT)
PART. G/KW HR (G/HP HR)	.212(	.158) (	.16)	
BSFC KG/KW HR (LB/HP HR)	.249(	.409)		
WORK KW HR (HP HR)	13.16(	17.65)		
BSCO2 G/KW HR (G/HP HR)	789. (	589.)		

90 MM FILTER NUMBERS	P90-59	P90-60
90 MM FILTER WT. GAINS (MG)	2.031	.090
PARTICULATE GRAMS/TEST	2.797	

SPRAY INJECTOR FAILURE

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-A-62FTI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/22/95 TIME 1:55	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 82.0°F RH 28.0 PCT AH 47.3 GR/LB	ENGINE DEW PT. 8.9°C (48.0°F)
ENGINE AIR TEMP. 15.6°C (60.0°F)	ENGINE ABS. HUM. 7.3 G/KG (50.9 GR/LB)	NOX HUMIDITY C.F. .941
		DRY-TO-WET C.F. .983

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.45 (1534.1)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.13)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	874.7 (30886.)
HC SAMPLE METER/RANGE/PPM	23.2/ 15/ 231.61
HC BCKGRD METER/RANGE/PPM	5.3/ 12/ 5.30
CO SAMPLE METER/RANGE/PPM	12.3/ 12/ 11.78
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	79.3/ 11/ .7011
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0433
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 44.71
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	18.76
HC CONCENTRATION PPM	226.59
CO CONCENTRATION PPM	11.52
CO2 CONCENTRATION PCT	.6601
NOX CONCENTRATION PPM	43.47
HC MASS GRAMS	113.852
CO MASS GRAMS	11.731
CO2 MASS GRAMS	10562.58
NOX MASS GRAMS	68.438
FUEL KG (LB)	3.438 (7.58)
KW HR (HP HR)	13.26 (17.78)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	8.587(6.403) (6.40) (CONT)
BSCO G/KW HR (G/HP HR)	.885(.660) (.66)
BSNOX G/KW HR (G/HP HR)	5.162(3.849) (3.85) (CONT)
PART. G/KW HR (G/HP HR)	.418(.312) (.31)
BSFC KG/KW HR (LB/HP HR)	.259(.426)
WORK KW HR (HP HR)	13.26(17.78)
BSCO2 G/KW HR (G/HP HR)	797. (594.)

90 MM FILTER NUMBERS	P90-61	P90-62
90 MM FILTER WT. GAINS (MG)	3.567	.524
PARTICULATE GRAMS/TEST	5.543	

POSSIBLE SPRAY FAILURE

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-A-62FI RUN
DATE 3/29/95 TIME 3:37
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 741.7 MM HG (29.20 IN HG)
ENGINE AIR TEMP. 15.6°C (60.0°F)

CVS: 74.0°F RH 37.0 PCT AH 47.2 GR/LB
ENGINE ABS. HUM. 10.6 G/KG (74.2 GR/LB)

ENGINE DEW PT. 14.5°C (58.1°F)
NOX HUMIDITY C.F. .998
DRY-TO-WET C.F. .983

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	43.31 (1529.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.11)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	871.5 (30771.)
HC SAMPLE METER/RANGE/PPM	3.6/ 13/ 304.49
HC BCKGRD METER/RANGE/PPM	4.2/ 12/ 4.20
CO SAMPLE METER/RANGE/PPM	12.1/ 12/ 11.59
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .38
CO2 SAMPLE METER/RANGE/PCT	79.4/ 11/ .7024
CO2 BCKGRD METER/RANGE/PCT	8.2/ 11/ .0483
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 42.75
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	18.55
HC CONCENTRATION PPM	300.52
CO CONCENTRATION PPM	10.94
CO2 CONCENTRATION PCT	.6567
NOX CONCENTRATION PPM	41.36
HC MASS GRAMS	150.435
CO MASS GRAMS	11.104
CO2 MASS GRAMS	10469.72
NOX MASS GRAMS	68.781
FUEL KG (LB)	3.445 (7.59)
KW HR (HP HR)	13.25 (17.77)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	11.353(8.466) (8.47) (CONT)
BSCO G/KW HR (G/HP HR)	.838(.625) (.62)
BSNOX G/KW HR (G/HP HR)	5.191(3.871) (3.87) (CONT)
PART. G/KW HR (G/HP HR)	2.081(1.552) (1.55)
BSFC KG/KW HR (LB/HP HR)	.260(.427)
WORK KW HR (HP HR)	13.25(17.77)
BSCO2 G/KW HR (G/HP HR)	790. (589.)

90 MM FILTER NUMBERS	P90-63	P90-64
90 MM FILTER WT. GAINS (MG)	*****	2.403
PARTICULATE GRAMS/TEST	27.579	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-B-63 RUN
DATE 3/30/95 TIME
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 741.7 MM HG (29.20 IN HG)
ENGINE AIR TEMP. 22.8°C (73.0°F)

CVS: 73.0°F RH 39.0 PCT AH 48.9 GR/LB
ENGINE ABS. HUM. 11.0 G/KG (77.0 GR/LB)

ENGINE DEW PT. 15.1°C (59.1°F)
NOX HUMIDITY C.F. 1.005
DRY-TO-WET C.F. .983

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.60 (1539.7)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.12)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	877.9 (30998.)
HC SAMPLE METER/RANGE/PPM	.1/ 13/ 6.28
HC BCKGRD METER/RANGE/PPM	5.2/ 12/ 5.20
CO SAMPLE METER/RANGE/PPM	5.6/ 12/ 5.32
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	74.7/ 11/ .6438
CO2 BCKGRD METER/RANGE/PCT	8.0/ 11/ .0470
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 46.03
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	21.11
HC CONCENTRATION PPM	1.32
CO CONCENTRATION PPM	5.10
CO2 CONCENTRATION PCT	.5990
NOX CONCENTRATION PPM	44.58
HC MASS GRAMS	.668
CO MASS GRAMS	5.213
CO2 MASS GRAMS	9619.90
NOX MASS GRAMS	75.231
FUEL KG (LB)	3.025 (6.67)
KW HR (HP HR)	13.22 (17.73)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.051(	.038) (	.04)	(CONT)
BSCO G/KW HR (G/HP HR)	.394(	.294) (	.29)	
BSNOX G/KW HR (G/HP HR)	5.690(	4.243) (	4.24)	(CONT)
PART. G/KW HR (G/HP HR)	.258(	.192) (	.19)	
BSFC KG/KW HR (LB/HP HR)	.229(	.376)		
WORK KW HR (HP HR)	13.22(	17.73)		
BSCO2 G/KW HR (G/HP HR)	728. (	543.)		

90 MM FILTER NUMBERS	P90-65	P90-66
90 MM FILTER WT. GAINS (MG)	2.380	.109
PARTICULATE GRAMS/TEST	3.412	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-C-64FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 3/30/95 TIME 2:13	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 740.9 MM HG (29.17 IN HG)	CVS: 73.0°F RH 43.0 PCT AH 53.3 GR/LB	ENGINE DEW PT. 16.4°C (61.5°F)
ENGINE AIR TEMP. 23.3°C (74.0°F)	ENGINE ABS. HUM. 12.0 G/KG (84.0 GR/LB)	NOX HUMIDITY C.F. 1.024
		DRY-TO-WET C.F. .981

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.25 (1527.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.12)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	870.8 (30748.)
HC SAMPLE METER/RANGE/PPM	3.2/ 13/ 268.55
HC BCKGRD METER/RANGE/PPM	8.6/ 12/ 8.60
CO SAMPLE METER/RANGE/PPM	11.8/ 12/ 11.30
CO BCKGRD METER/RANGE/PPM	.7/ 12/ .66
CO2 SAMPLE METER/RANGE/PCT	80.0/ 11/ .7101
CO2 BCKGRD METER/RANGE/PCT	8.8/ 11/ .0520
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 43.14
NOX BCKGRD METER/RANGE/PPM	1.0/ 2/ 1.00
DILUTION FACTOR	18.44
HC CONCENTRATION PPM	260.41
CO CONCENTRATION PPM	10.37
CO2 CONCENTRATION PCT	.6609
NOX CONCENTRATION PPM	41.39
HC MASS GRAMS	130.262
CO MASS GRAMS	10.517
CO2 MASS GRAMS	10528.27
NOX MASS GRAMS	70.593
FUEL KG (LB)	3.443 (7.59)
KW HR (HP HR)	13.25 (17.77)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	9.830(7.330) (7.33) (CONT)	90 MM FILTER NUMBERS P90-67 P90-68
BSCO G/KW HR (G/HP HR)	.794(.592) (.59)	90 MM FILTER WT. GAINS (MG) 5.988 .971
BSNOX G/KW HR (G/HP HR)	5.327(3.973) (3.97) (CONT)	PARTICULATE GRAMS/TEST 9.463
PART. G/KW HR (G/HP HR)	.714(.533) (.53)	
BSFC KG/KW HR (LB/HP HR)	.260(.427)	
WORK KW HR (HP HR)	13.25(17.77)	
BSCO2 G/KW HR (G/HP HR)	795. (592.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-D-65EI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 3/31/95 TIME 11:38	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 742.4 MM HG (29.23 IN HG)	CVS: 77.0°F RH 39.0 PCT AH 55.5 GR/LB	ENGINE DEW PT. 16.4°C (61.5°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 12.0 G/KG (83.9 GR/LB)	NOX HUMIDITY C.F. 1.024
		DRY-TO-WET C.F. .981

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.6
TOT. BLOWER RATE SCMM (SCFM)	43.56 (1538.0)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.11)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	876.5 (30951.)
HC SAMPLE METER/RANGE/PPM	1.6/ 13/ 133.80
HC BCKGRD METER/RANGE/PPM	4.9/ 12/ 4.90
CO SAMPLE METER/RANGE/PPM	6.4/ 12/ 6.09
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .38
CO2 SAMPLE METER/RANGE/PCT	80.1/ 11/ .7113
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.94
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	18.77
HC CONCENTRATION PPM	129.16
CO CONCENTRATION PPM	5.58
CO2 CONCENTRATION PCT	.6715
NOX CONCENTRATION PPM	45.57
HC MASS GRAMS	65.033
CO MASS GRAMS	5.691
CO2 MASS GRAMS	10767.56
NOX MASS GRAMS	78.195
FUEL KG (LB)	3.451 (7.61)
KW HR (HP HR)	13.21 (17.72)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	4.922(3.670) (3.67) (CONT)
BSCO G/KW HR (G/HP HR)	.431(.321) (.32)
BSNOX G/KW HR (G/HP HR)	5.918(4.413) (4.41) (CONT)
PART. G/KW HR (G/HP HR)	.247(.184) (.18)
BSFC KG/KW HR (LB/HP HR)	.261(.429)
WORK KW HR (HP HR)	13.21(17.72)
BSCO2 G/KW HR (G/HP HR)	815. (608.)

90 MM FILTER NUMBERS	P90-69	P90-70
90 MM FILTER WT. GAINS (MG)	2.267	.084
PARTICULATE GRAMS/TEST	3.265	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT-TRANS ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-A-66FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 3/31/95 TIME 2:43	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 74.0°F RH 44.0 PCT AH 56.1 GR/LB	ENGINE DEW PT. 16.2°C (61.2°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 11.9 G/KG (83.0 GR/LB)	NOX HUMIDITY C.F. 1.021
		DRY-TO-WET C.F. .981

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.2
TOT. BLOWER RATE SCMM (SCFM)	43.51 (1536.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.12)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	875.4 (30911.)
HC SAMPLE METER/RANGE/PPM	3.4/ 13/ 288.63
HC BCKGRD METER/RANGE/PPM	4.4/ 12/ 4.40
CO SAMPLE METER/RANGE/PPM	12.4/ 12/ 11.88
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	78.4/ 11/ .6897
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 41.40
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	18.91
HC CONCENTRATION PPM	284.46
CO CONCENTRATION PPM	11.47
CO2 CONCENTRATION PCT	.6498
NOX CONCENTRATION PPM	40.14
HC MASS GRAMS	143.046
CO MASS GRAMS	11.690
CO2 MASS GRAMS	10406.48
NOX MASS GRAMS	68.638
FUEL KG (LB)	3.418 (7.54)
KW HR (HP HR)	13.26 (17.78)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	10.789(8.045) (8.05) (CONT)	90 MM FILTER NUMBERS P90-71 P90-72
BSCO G/KW HR (G/HP HR)	.882(.657) (.66)	90 MM FILTER WT. GAINS (MG) ***** 2.007
BSNOX G/KW HR (G/HP HR)	5.177(3.860) (3.86) (CONT)	PARTICULATE GRAMS/TEST 24.776
PART. G/KW HR (G/HP HR)	1.869(1.393) (1.39)	
BSFC KG/KW HR (LB/HP HR)	.258(.424)	
WORK KW HR (HP HR)	13.26(17.78)	
BSCO2 G/KW HR (G/HP HR)	785. (585.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-A-67FEI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 6/95 TIME 1:35	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 738.1 MM HG (29.06 IN HG)	CVS: 75.0°F RH 48.0 PCT AH 64.0 GR/LB	ENGINE DEW PT. 11.9°C (53.4°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 9.0 G/KG (62.7 GR/LB)	NOX HUMIDITY C.F. .969
		DRY-TO-WET C.F. .979

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.7
TOT. BLOWER RATE SCMM (SCFM)	43.32 (1529.6)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.03)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	872.5 (30810.)
HC SAMPLE METER/RANGE/PPM	.7/ 13/ 58.16
HC BCKGRD METER/RANGE/PPM	5.9/ 12/ 5.90
CO SAMPLE METER/RANGE/PPM	5.7/ 12/ 5.42
CO BCKGRD METER/RANGE/PPM	.4/ 12/ .38
CO2 SAMPLE METER/RANGE/PCT	81.1/ 11/ .7243
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.68
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .80
DILUTION FACTOR	18.63
HC CONCENTRATION PPM	52.57
CO CONCENTRATION PPM	4.91
CO2 CONCENTRATION PCT	.6821
NOX CONCENTRATION PPM	44.94
HC MASS GRAMS	26.351
CO MASS GRAMS	4.986
CO2 MASS GRAMS	10888.01
NOX MASS GRAMS	72.663
FUEL KG (LB)	3.449 (7.60)
KW HR (HP HR)	13.17 (17.66)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	2.001(1.492) (1.49) (CONT)	90 MM FILTER NUMBERS P90-73 P90-74
BSCO G/KW HR (G/HP HR)	.379(.282) (.28)	90 MM FILTER WT. GAINS (MG) 2.485 .207
BSNOX G/KW HR (G/HP HR)	5.518(4.115) (4.11) (CONT)	PARTICULATE GRAMS/TEST 3.998
PART. G/KW HR (G/HP HR)	.304(.226) (.23)	
BSFC KG/KW HR (LB/HP HR)	.262(.431)	
WORK KW HR (HP HR)	13.17(17.66)	
BSCO2 G/KW HR (G/HP HR)	827. (617.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-B-68 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 7/95 TIME 12:03	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	
BAROMETER 738.6 MM HG (29.08 IN HG)	CVS: 75.0°F RH 51.0 PCT AH 68.7 GR/LB	ENGINE DEW PT. 11.0°C (51.8°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 8.4 G/KG (59.0 GR/LB)	NOX HUMIDITY C.F. .960
		DRY-TO-WET C.F. .978

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.3
TOT. BLOWER RATE SCMM (SCFM)	43.46 (1534.5)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.02)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	875.1 (30898.)
HC SAMPLE METER/RANGE/PPM	.1/ 13/ 5.27
HC BCKGRD METER/RANGE/PPM	4.9/ 12/ 4.90
CO SAMPLE METER/RANGE/PPM	2.8/ 12/ 2.65
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	79.2/ 11/ .6998
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.93
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	19.43
HC CONCENTRATION PPM	.62
CO CONCENTRATION PPM	2.48
CO2 CONCENTRATION PCT	.6581
NOX CONCENTRATION PPM	46.50
HC MASS GRAMS	.312
CO MASS GRAMS	2.530
CO2 MASS GRAMS	10535.64
NOX MASS GRAMS	74.711
FUEL KG (LB)	3.311 (7.30)
KW HR (HP HR)	13.18 (17.67)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.024(.018)	(.02)	(CONT)	
BSCO G/KW HR (G/HP HR)	.192(.143)	(.14)		
BSNOX G/KW HR (G/HP HR)	5.670(4.228)	(4.23)	(CONT)	
PART. G/KW HR (G/HP HR)	.290(.217)	(.22)		
BSFC KG/KW HR (LB/HP HR)	.251(.413)			
WORK KW HR (HP HR)	13.18(17.67)			
BSCO2 G/KW HR (G/HP HR)	800. (596.)			

90 MM FILTER NUMBERS	P90-75	P90-76
90 MM FILTER WT. GAINS (MG)	2.481	.062
PARTICULATE GRAMS/TEST	3.827	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-A-69EI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/10/95 TIME 11:33	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 730.5 MM HG (28.76 IN HG)	CVS: 77.0°F RH 63.0 PCT AH 92.1 GR/LB	ENGINE DEW PT. 11.3°C (52.3°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 8.7 G/KG (60.8 GR/LB)	NOX HUMIDITY C.F. .964
		DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.6
TOT. BLOWER RATE SCMM (SCFM)	42.83 (1512.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (.95)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	861.8 (30430.)
HC SAMPLE METER/RANGE/PPM	.5/ 13/ 38.84
HC BCKGRD METER/RANGE/PPM	4.6/ 12/ 4.60
CO SAMPLE METER/RANGE/PPM	4.9/ 12/ 4.65
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	80.5/ 11/ .7165
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.24
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	18.88
HC CONCENTRATION PPM	34.48
CO CONCENTRATION PPM	4.41
CO2 CONCENTRATION PCT	.6766
NOX CONCENTRATION PPM	46.54
HC MASS GRAMS	17.070
CO MASS GRAMS	4.421
CO2 MASS GRAMS	10667.38
NOX MASS GRAMS	73.978
FUEL KG (LB)	3.370 (7.43)
KW HR (HP HR)	13.06 (17.52)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.307(.974)	(.97)	(CONT)	
BSCO G/KW HR (G/HP HR)	.338(.252)	(.25)		
BSNOX G/KW HR (G/HP HR)	5.662(4.223)	(4.22)	(CONT)	
PART. G/KW HR (G/HP HR)	.301(.225)	(.22)		
BSFC KG/KW HR (LB/HP HR)	.258(.424)			
WORK KW HR (HP HR)	13.06(17.52)			
BSCO2 G/KW HR (G/HP HR)	817. (609.)			

90 MM FILTER NUMBERS	P90-77	P90-78
90 MM FILTER WT. GAINS (MG)	2.398	.066
PARTICULATE GRAMS/TEST	3.936	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-B-70E RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/10/95 TIME 12:13	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 729.7 MM HG (28.73 IN HG)	CVS: 75.0°F RH 66.0 PCT AH 90.2 GR/LB	ENGINE DEW PT. 11.4°C (52.6°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 8.8 G/KG (61.6 GR/LB)	NOX HUMIDITY C.F. .966
		DRY-TO-WET C.F. .973

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.5
TOT. BLOWER RATE SCMM (SCFM)	42.84 (1512.8)
TOT. 90MM RATE SCMM (SCFM)	.03 (.95)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	862.1 (30439.)
HC SAMPLE METER/RANGE/PPM	.7/ 13/ 61.85
HC BCKGRD METER/RANGE/PPM	5.7/ 12/ 5.70
CO SAMPLE METER/RANGE/PPM	4.1/ 12/ 3.89
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	83.2/ 11/ .7519
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.62
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .80
DILUTION FACTOR	17.95
HC CONCENTRATION PPM	56.47
CO CONCENTRATION PPM	3.49
CO2 CONCENTRATION PCT	.7098
NOX CONCENTRATION PPM	45.57
HC MASS GRAMS	27.961
CO MASS GRAMS	3.501
CO2 MASS GRAMS	11193.89
NOX MASS GRAMS	72.588
FUEL KG (LB)	3.546 (7.82)
KW HR (HP HR)	13.04 (17.49)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	2.144(1.599) (1.60) (CONT)	
BSCO G/KW HR (G/HP HR)	.268(.200) (.20)	
BSNOX G/KW HR (G/HP HR)	5.566(4.150) (4.15) (CONT)	
PART. G/KW HR (G/HP HR)	.398(.297) (.30)	
BSFC KG/KW HR (LB/HP HR)	.272(.447)	
WORK KW HR (HP HR)	13.04(17.49)	
BSCO2 G/KW HR (G/HP HR)	858. (640.)	

90 MM FILTER NUMBERS	P90-79	P90-80
90 MM FILTER WT. GAINS (MG)	3.181	.085
PARTICULATE GRAMS/TEST	5.187	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-71 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/11/95 TIME 11:32	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 75.0°F RH 22.0 PCT AH 29.1 GR/LB	ENGINE DEW PT. 13.1°C (55.6°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 9.7 G/KG (67.7 GR/LB)	NOX HUMIDITY C.F. .981
		DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.34 (1530.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.04)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	872.2 (30796.)
HC SAMPLE METER/RANGE/PPM	.1/ 13/ 10.82
HC BCKGRD METER/RANGE/PPM	4.2/ 12/ 4.20
CO SAMPLE METER/RANGE/PPM	25.7/ 12/ 24.92
CO BCKGRD METER/RANGE/PPM	.8/ 12/ .76
CO2 SAMPLE METER/RANGE/PCT	79.1/ 11/ .6985
CO2 BCKGRD METER/RANGE/PCT	8.0/ 11/ .0470
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 49.12
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	19.39
HC CONCENTRATION PPM	6.84
CO CONCENTRATION PPM	23.70
CO2 CONCENTRATION PCT	.6539
NOX CONCENTRATION PPM	47.82
HC MASS GRAMS	3.424
CO MASS GRAMS	24.061
CO2 MASS GRAMS	10433.90
NOX MASS GRAMS	78.273
FUEL KG (LB)	3.293 (7.26)
KW HR (HP HR)	13.09 (17.55)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.262(.195) (.20) (CONT)	90 MM FILTER NUMBERS P90-81 P90-82
BSCO G/KW HR (G/HP HR)	1.839(1.371) (1.37)	90 MM FILTER WT. GAINS (MG) 2.156 .113
BSNOX G/KW HR (G/HP HR)	5.981(4.460) (4.46) (CONT)	PARTICULATE GRAMS/TEST 3.325
PART. G/KW HR (G/HP HR)	.254(.189) (.19)	
BSFC KG/KW HR (LB/HP HR)	.252(.414)	
WORK KW HR (HP HR)	13.09(17.55)	
BSCO2 G/KW HR (G/HP HR)	797. (595.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST 300-A-72 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/11/95 TIME 12:12	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.7 MM HG (29.20 IN HG)	CVS: 76.0°F RH 20.0 PCT AH 27.4 GR/LB	ENGINE DEW PT. 13.5°C (56.3°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 9.9 G/KG (69.5 GR/LB)	NOX HUMIDITY C.F. .986
		DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.2
TOT. BLOWER RATE SCMM (SCFM)	43.76 (1545.1)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.11)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	881.1 (31111.)
HC SAMPLE METER/RANGE/PPM	.1/ 13/ 10.96
HC BCKGRD METER/RANGE/PPM	4.1/ 12/ 4.10
CO SAMPLE METER/RANGE/PPM	25.3/ 12/ 24.52
CO BCKGRD METER/RANGE/PPM	.6/ 12/ .57
CO2 SAMPLE METER/RANGE/PCT	78.9/ 11/ .6960
CO2 BCKGRD METER/RANGE/PCT	7.9/ 11/ .0464
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 48.08
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	19.46
HC CONCENTRATION PPM	7.07
CO CONCENTRATION PPM	23.51
CO2 CONCENTRATION PCT	.6520
NOX CONCENTRATION PPM	46.91
HC MASS GRAMS	3.578
CO MASS GRAMS	24.110
CO2 MASS GRAMS	10508.92
NOX MASS GRAMS	77.916
FUEL KG (LB)	3.317 (7.31)
KW HR (HP HR)	13.14 (17.62)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.272(.203) (.20) (CONT)	90 MM FILTER NUMBERS	P90-83	P90-84
BSCO G/KW HR (G/HP HR)	1.835(1.368) (1.37)	90 MM FILTER WT. GAINS (MG)	2.224	.110
BSNOX G/KW HR (G/HP HR)	5.930(4.422) (4.42) (CONT)	PARTICULATE GRAMS/TEST	3.244	
PART. G/KW HR (G/HP HR)	.247(.184) (.18)			
BSFC KG/KW HR (LB/HP HR)	.252(.415)			
WORK KW HR (HP HR)	13.14(17.62)			
BSCO2 G/KW HR (G/HP HR)	800. (596.)			

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-A-73 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/12/95 TIME 11:59	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 745.0 MM HG (29.33 IN HG)	CVS: 74.0°F RH 33.0 PCT AH 42.7 GR/LB	ENGINE DEW PT. 13.2°C (55.8°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 9.7 G/KG (67.9 GR/LB)	NOX HUMIDITY C.F. .982
		DRY-TO-WET C.F. .984

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.8
TOT. BLOWER RATE SCMM (SCFM)	43.66 (1541.7)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.13)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	878.8 (31032.)
HC SAMPLE METER/RANGE/PPM	.0/ 13/ 3.27
HC BCKGRD METER/RANGE/PPM	5.1/ 12/ 5.10
CO SAMPLE METER/RANGE/PPM	.3/ 12/ .28
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	77.9/ 11/ .6834
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 45.65
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	19.91
HC CONCENTRATION PPM	-1.58
CO CONCENTRATION PPM	.28
CO2 CONCENTRATION PCT	.6434
NOX CONCENTRATION PPM	44.64
HC MASS GRAMS	.000
CO MASS GRAMS	.283
CO2 MASS GRAMS	10343.99
NOX MASS GRAMS	73.664
FUEL KG (LB)	3.250 (7.16)
KW HR (HP HR)	13.17 (17.66)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(.000)	(.00)	(CONT)	
BSCO G/KW HR (G/HP HR)	.021(.016)	(.02)		
BSNOX G/KW HR (G/HP HR)	5.594(4.171)	(4.17)	(CONT)	
PART. G/KW HR (G/HP HR)	.195(.146)	(.15)		
BSFC KG/KW HR (LB/HP HR)	.247(.406)			
WORK KW HR (HP HR)	13.17(17.66)			
BSCO2 G/KW HR (G/HP HR)	785. (586.)			

90 MM FILTER NUMBERS	P90-85	P90-86
90 MM FILTER WT. GAINS (MG)	1.811	.071
PARTICULATE GRAMS/TEST	2.570	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-B-74FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/12/95 TIME 12:39	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 744.7 MM HG (29.32 IN HG)	CVS: 75.0°F RH 28.0 PCT AH 36.9 GR/LB	ENGINE DEW PT. 13.2°C (55.8°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 9.7 G/KG (67.9 GR/LB)	NOX HUMIDITY C.F. .982
		DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.73 (1544.1)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.14)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	880.1 (31078.)
HC SAMPLE METER/RANGE/PPM	.2/ 13/ 16.70
HC BCKGRD METER/RANGE/PPM	5.0/ 12/ 5.00
CO SAMPLE METER/RANGE/PPM	3.8/ 12/ 3.60
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	83.5/ 11/ .7559
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 39.36
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	17.96
HC CONCENTRATION PPM	11.98
CO CONCENTRATION PPM	3.43
CO2 CONCENTRATION PCT	.7138
NOX CONCENTRATION PPM	38.38
HC MASS GRAMS	6.055
CO MASS GRAMS	3.515
CO2 MASS GRAMS	11492.94
NOX MASS GRAMS	63.436
FUEL KG (LB)	3.618 (7.98)
KW HR (HP HR)	13.14 (17.62)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.461(.344)	(.34)	(CONT)	
BSCO G/KW HR (G/HP HR)	.268(.199)	(.20)		
BSNOX G/KW HR (G/HP HR)	4.828(3.600)	(3.60)	(CONT)	
PART. G/KW HR (G/HP HR)	.231(.172)	(.17)		
BSFC KG/KW HR (LB/HP HR)	.275(.453)			
WORK KW HR (HP HR)	13.14(17.62)			
BSCO2 G/KW HR (G/HP HR)	875. (652.)			

90 MM FILTER NUMBERS	P90-87	P90-88
90 MM FILTER WT. GAINS (MG)	2.178	.063
PARTICULATE GRAMS/TEST	3.036	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-C-75FI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/12/95 TIME 1:19	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 744.5 MM HG (29.31 IN HG)	CVS: 76.0°F RH 26.0 PCT AH 35.2 GR/LB	ENGINE DEW PT. 14.0°C (57.2°F)
ENGINE AIR TEMP. 22.8°C (73.0°F)	ENGINE ABS. HUM. 10.2 G/KG (71.5 GR/LB)	NOX HUMIDITY C.F. .991
		DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.9
TOT. BLOWER RATE SCMM (SCFM)	43.48 (1535.2)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.16)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	875.2 (30903.)
HC SAMPLE METER/RANGE/PPM	.3/ 13/ 29.12
HC BCKGRD METER/RANGE/PPM	5.0/ 12/ 5.00
CO SAMPLE METER/RANGE/PPM	4.9/ 12/ 4.65
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	83.9/ 11/ .7612
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	.4/ 13/ 37.14
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	17.80
HC CONCENTRATION PPM	24.40
CO CONCENTRATION PPM	4.46
CO2 CONCENTRATION PCT	.7197
NOX CONCENTRATION PPM	36.11
HC MASS GRAMS	12.266
CO MASS GRAMS	4.543
CO2 MASS GRAMS	11523.60
NOX MASS GRAMS	59.904
FUEL KG (LB)	3.635 (8.01)
KW HR (HP HR)	13.21 (17.72)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.928(.692) (.69) (CONT)	90 MM FILTER NUMBERS P90-89 P90-90
BSCO G/KW HR (G/HP HR)	.344(.256) (.26)	90 MM FILTER WT. GAINS (MG) 3.062 .093
BSNOX G/KW HR (G/HP HR)	4.533(3.381) (3.38) (CONT)	PARTICULATE GRAMS/TEST 4.181
PART. G/KW HR (G/HP HR)	.316(.236) (.24)	
BSFC KG/KW HR (LB/HP HR)	.275(.452)	
WORK KW HR (HP HR)	13.21(17.72)	
BSCO2 G/KW HR (G/HP HR)	872. (650.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-A-76Ei RUN
DATE 4/18/95 TIME 11:35
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 738.4 MM HG (29.07 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 72.0°F RH 42.0 PCT AH 50.9 GR/LB
ENGINE ABS. HUM. 9.8 G/KG (68.5 GR/LB)

ENGINE DEW PT. 13.2°C (55.8°F)
NOX HUMIDITY C.F. .983
DRY-TO-WET C.F. .982

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.7
TOT. BLOWER RATE SCMM (SCFM)	43.52 (1536.7)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.05)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	875.9 (30927.)
HC SAMPLE METER/RANGE/PPM	.0/ 13/ 3.59
HC BCKGRD METER/RANGE/PPM	2.6/ 12/ 2.60
CO SAMPLE METER/RANGE/PPM	1.0/ 12/ .94
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	78.4/ 11/ .6897
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 45.21
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	19.72
HC CONCENTRATION PPM	1.12
CO CONCENTRATION PPM	.65
CO2 CONCENTRATION PCT	.6520
NOX CONCENTRATION PPM	44.03
HC MASS GRAMS	.564
CO MASS GRAMS	.667
CO2 MASS GRAMS	10447.54
NOX MASS GRAMS	72.519
FUEL KG (LB)	3.283 (7.24)
KW HR (HP HR)	13.10 (17.57)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	.043(.032)	(.03)	(CONT)
BSCO	G/KW HR (G/HP HR)	.051(.038)	(.04)	
BSNOX	G/KW HR (G/HP HR)	5.535(4.127)	(4.13)	(CONT)
PART.	G/KW HR (G/HP HR)	.206(.153)	(.15)	
BSFC	KG/KW HR (LB/HP HR)	.251(.412)		
WORK	KW HR (HP HR)	13.10(17.57)		
BSCO2	G/KW HR (G/HP HR)	797. (595.)		

90 MM FILTER NUMBERS	P90-91	P90-92
90 MM FILTER WT. GAINS (MG)	1.790	.048
PARTICULATE GRAMS/TEST	2.693	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-B-77 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/18/95 TIME 12:23	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 738.1 MM HG (29.06 IN HG)	CVS: 71.0°F RH 38.0 PCT AH 44.1 GR/LB	ENGINE DEW PT. 13.2°C (55.8°F)
ENGINE AIR TEMP. 22.2°C (72.0°F)	ENGINE ABS. HUM. 9.8 G/KG (68.5 GR/LB)	NOX HUMIDITY C.F. .983
		DRY-TO-WET C.F. .984

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1206.4
TOT. BLOWER RATE SCMM (SCFM)	43.44 (1533.7)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.08)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	874.0 (30860.)
HC SAMPLE METER/RANGE/PPM	.0/ 13/ 2.87
HC BCKGRD METER/RANGE/PPM	2.4/ 12/ 2.40
CO SAMPLE METER/RANGE/PPM	.5/ 12/ .47
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	79.1/ 11/ .6985
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 46.82
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	19.48
HC CONCENTRATION PPM	.59
CO CONCENTRATION PPM	.37
CO2 CONCENTRATION PCT	.6603
NOX CONCENTRATION PPM	45.39
HC MASS GRAMS	.297
CO MASS GRAMS	.378
CO2 MASS GRAMS	10557.83
NOX MASS GRAMS	74.609
FUEL KG (LB)	3.317 (7.31)
KW HR (HP HR)	13.10 (17.57)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.023(.017) (.02) (CONT)	90 MM FILTER NUMBERS P90-93 P90-94
BSCO G/KW HR (G/HP HR)	.029(.022) (.02)	90 MM FILTER WT. GAINS (MG) 1.864 .052
BSNOX G/KW HR (G/HP HR)	5.694(4.246) (4.25) (CONT)	PARTICULATE GRAMS/TEST 2.720
PART. G/KW HR (G/HP HR)	.208(.155) (.15)	
BSFC KG/KW HR (LB/HP HR)	.253(.416)	
WORK KW HR (HP HR)	13.10(17.57)	
BSCO2 G/KW HR (G/HP HR)	806. (601.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-A-78Ei RUN
DATE 4/18/95 TIME 4:21
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 738.4 MM HG (29.07 IN HG)
ENGINE AIR TEMP. 23.3°C (74.0°F)

CVS: 72.0°F RH 32.0 PCT AH 38.3 GR/LB
ENGINE ABS. HUM. 9.7 G/KG (67.7 GR/LB)

ENGINE DEW PT. 13.1°C (55.5°F)
NOX HUMIDITY C.F. .981
DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.0
TOT. BLOWER RATE SCMM (SCFM)	43.44 (1533.9)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.09)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	874.5 (30879.)
HC SAMPLE METER/RANGE/PPM	.5/ 13/ 37.89
HC BCKGRD METER/RANGE/PPM	3.4/ 12/ 3.40
CO SAMPLE METER/RANGE/PPM	2.0/ 12/ 1.89
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	78.7/ 11/ .6935
CO2 BCKGRD METER/RANGE/PCT	7.3/ 11/ .0427
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 41.02
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	19.52
HC CONCENTRATION PPM	34.66
CO CONCENTRATION PPM	1.85
CO2 CONCENTRATION PCT	.6529
NOX CONCENTRATION PPM	40.03
HC MASS GRAMS	17.412
CO MASS GRAMS	1.880
CO2 MASS GRAMS	10445.83
NOX MASS GRAMS	65.700
FUEL KG (LB)	3.300 (7.28)
KW HR (HP HR)	13.16 (17.65)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	1.323(.987)	(.99)	(CONT)
BSCO	G/KW HR (G/HP HR)	.143(.107)	(.11)	
BSNOX	G/KW HR (G/HP HR)	4.992(3.722)	(3.72)	(CONT)
PART.	G/KW HR (G/HP HR)	.208(.155)	(.16)	
BSFC	KG/KW HR (LB/HP HR)	.251(.412)		
WORK	KW HR (HP HR)	13.16(17.65)		
BSCO2	G/KW HR (G/HP HR)	794. (592.)		

90 MM FILTER NUMBERS	P90-95	P90-96
90 MM FILTER WT. GAINS (MG)	1.893	.058
PARTICULATE GRAMS/TEST	2.740	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST ORP-A-79EI RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/21/95 TIME 2:35	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 733.8 MM HG (28.89 IN HG)	CVS: 73.0°F RH 47.0 PCT AH 58.6 GR/LB	ENGINE DEW PT. 12.5°C (54.5°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 9.4 G/KG (65.7 GR/LB)	NOX HUMIDITY C.F. .976
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1208.0
TOT. BLOWER RATE SCMM (SCFM)	43.11 (1522.1)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.06)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	868.5 (30667.)
HC SAMPLE METER/RANGE/PPM	.6/ 13/ 52.36
HC BCKGRD METER/RANGE/PPM	6.2/ 12/ 6.20
CO SAMPLE METER/RANGE/PPM	4.5/ 12/ 4.27
CO BCKGRD METER/RANGE/PPM	.6/ 12/ .57
CO2 SAMPLE METER/RANGE/PCT	80.0/ 11/ .7101
CO2 BCKGRD METER/RANGE/PCT	8.0/ 11/ .0470
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.35
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	19.02
HC CONCENTRATION PPM	46.48
CO CONCENTRATION PPM	3.62
CO2 CONCENTRATION PCT	.6655
NOX CONCENTRATION PPM	45.75
HC MASS GRAMS	23.190
CO MASS GRAMS	3.660
CO2 MASS GRAMS	10573.75
NOX MASS GRAMS	74.197
FUEL KG (LB)	3.347 (7.38)
KW HR (HP HR)	13.09 (17.56)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.771(1.321) (1.32) (CONT)	90 MM FILTER NUMBERS P90-101 P90-102
BSCO G/KW HR (G/HP HR)	.280(.208) (.21)	90 MM FILTER WT. GAINS (MG) 2.004 .042
BSNOX G/KW HR (G/HP HR)	5.666(4.225) (4.23) (CONT)	PARTICULATE GRAMS/TEST 2.935
PART. G/KW HR (G/HP HR)	.224(.167) (.17)	
BSFC KG/KW HR (LB/HP HR)	.256(.420)	
WORK KW HR (HP HR)	13.09(17.56)	
BSCO2 G/KW HR (G/HP HR)	807. (602.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST ORP-B-80FI RUN
DATE 4/24/95 TIME 3:40
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 741.7 MM HG (29.20 IN HG)
ENGINE AIR TEMP. 22.2°C (72.0°F)

CVS: 74.0°F RH 30.0 PCT AH 38.8 GR/LB
ENGINE ABS. HUM. 7.8 G/KG (54.5 GR/LB)

ENGINE DEW PT. 9.9°C (49.8°F)
NOX HUMIDITY C.F. .949
DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.0
TOT. BLOWER RATE SCMM (SCFM)	43.59 (1539.3)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.11)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	877.6 (30987.)
HC SAMPLE METER/RANGE/PPM	1.8/ 13/ 154.36
HC BCKGRD METER/RANGE/PPM	4.1/ 12/ 4.10
CO SAMPLE METER/RANGE/PPM	9.0/ 12/ 8.59
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	78.6/ 11/ .6922
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	.5/ 13/ 43.50
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	19.21
HC CONCENTRATION PPM	150.47
CO CONCENTRATION PPM	8.39
CO2 CONCENTRATION PCT	.6546
NOX CONCENTRATION PPM	42.37
HC MASS GRAMS	75.853
CO MASS GRAMS	8.575
CO2 MASS GRAMS	10509.23
NOX MASS GRAMS	67.513
FUEL KG (LB)	3.382 (7.46)
KW HR (HP HR)	13.13 (17.61)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	5.776(4.307)	(4.31)	(CONT)
BSCO	G/KW HR (G/HP HR)	.653(.487)	(.49)	
BSNOX	G/KW HR (G/HP HR)	5.141(3.834)	(3.83)	(CONT)
PART.	G/KW HR (G/HP HR)	.752(.561)	(.56)	
BSFC	KG/KW HR (LB/HP HR)	.258(.423)		
WORK	KW HR (HP HR)	13.13(17.61)		
BSCO2	G/KW HR (G/HP HR)	800. (597.)		

90 MM FILTER NUMBERS	P90-103	P90-104
90 MM FILTER WT. GAINS (MG)	6.197	.899
PARTICULATE GRAMS/TEST	9.875	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB HOT ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST ORP-C-81 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/20/95 TIME 4:28	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	
BAROMETER 738.4 MM HG (29.07 IN HG)	CVS: 75.0°F RH 25.0 PCT AH 33.4 GR/LB	ENGINE DEW PT. 12.2°C (54.0°F)
ENGINE AIR TEMP. 23.3°C (74.0°F)	ENGINE ABS. HUM. 9.2 G/KG (64.1 GR/LB)	NOX HUMIDITY C.F. .972
		DRY-TO-WET C.F. .986

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	1207.1
TOT. BLOWER RATE SCMM (SCFM)	43.69 (1542.7)
TOT. 90MM RATE SCMM (SCFM)	.03 (1.08)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	879.6 (31059.)
HC SAMPLE METER/RANGE/PPM	.0/ 13/ 4.05
HC BCKGRD METER/RANGE/PPM	4.1/ 12/ 4.10
CO SAMPLE METER/RANGE/PPM	4.1/ 12/ 3.89
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	78.7/ 11/ .6935
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	.6/ 13/ 47.52
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	19.61
HC CONCENTRATION PPM	.16
CO CONCENTRATION PPM	3.72
CO2 CONCENTRATION PCT	.6547
NOX CONCENTRATION PPM	46.48
HC MASS GRAMS	.080
CO MASS GRAMS	3.807
CO2 MASS GRAMS	10534.69
NOX MASS GRAMS	76.033
FUEL KG (LB)	3.311 (7.30)
KW HR (HP HR)	13.12 (17.60)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.006(	.005)	(.00)	(CONT)	
BSCO G/KW HR (G/HP HR)	.290(	.216)	(.22)		
BSNOX G/KW HR (G/HP HR)	5.793(	4.320)	(4.32)	(CONT)	
PART. G/KW HR (G/HP HR)	.203(	.151)	(.15)		
BSFC KG/KW HR (LB/HP HR)	.252(	.415)			
WORK KW HR (HP HR)	13.12(	17.60)			
BSCO2 G/KW HR (G/HP HR)	803. (	599.)			

90 MM FILTER NUMBERS	P90-97	P90-98
90 MM FILTER WT. GAINS (MG)	1.806	.063
PARTICULATE GRAMS/TEST	2.659	

APPENDIX E

ADDITIONAL NO_x REDUCTION PLOTS FOR CATALYST GROUP "B"

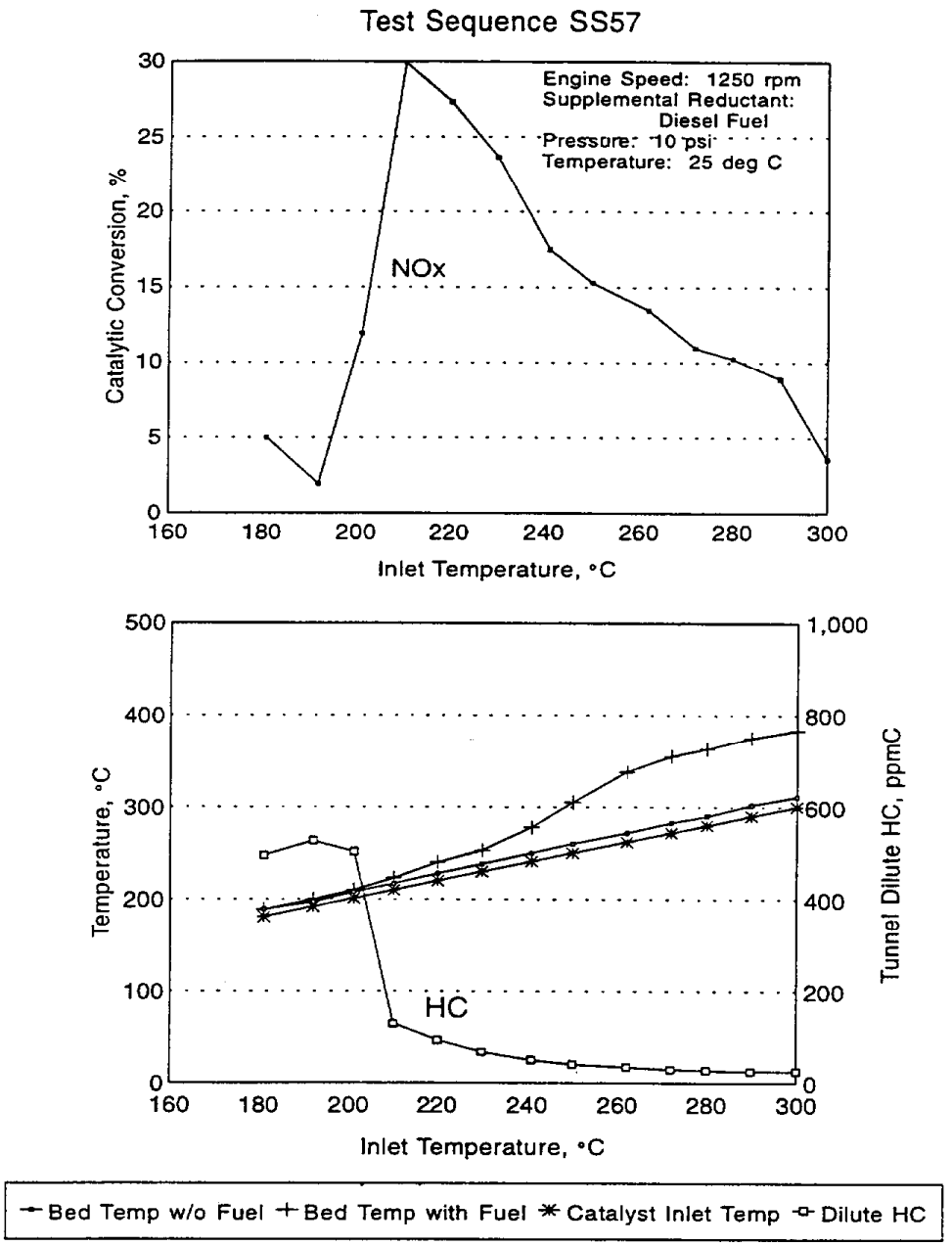

FIGURE E-1. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE -- CATALYST DG-2, TEST SEQUENCE SS57

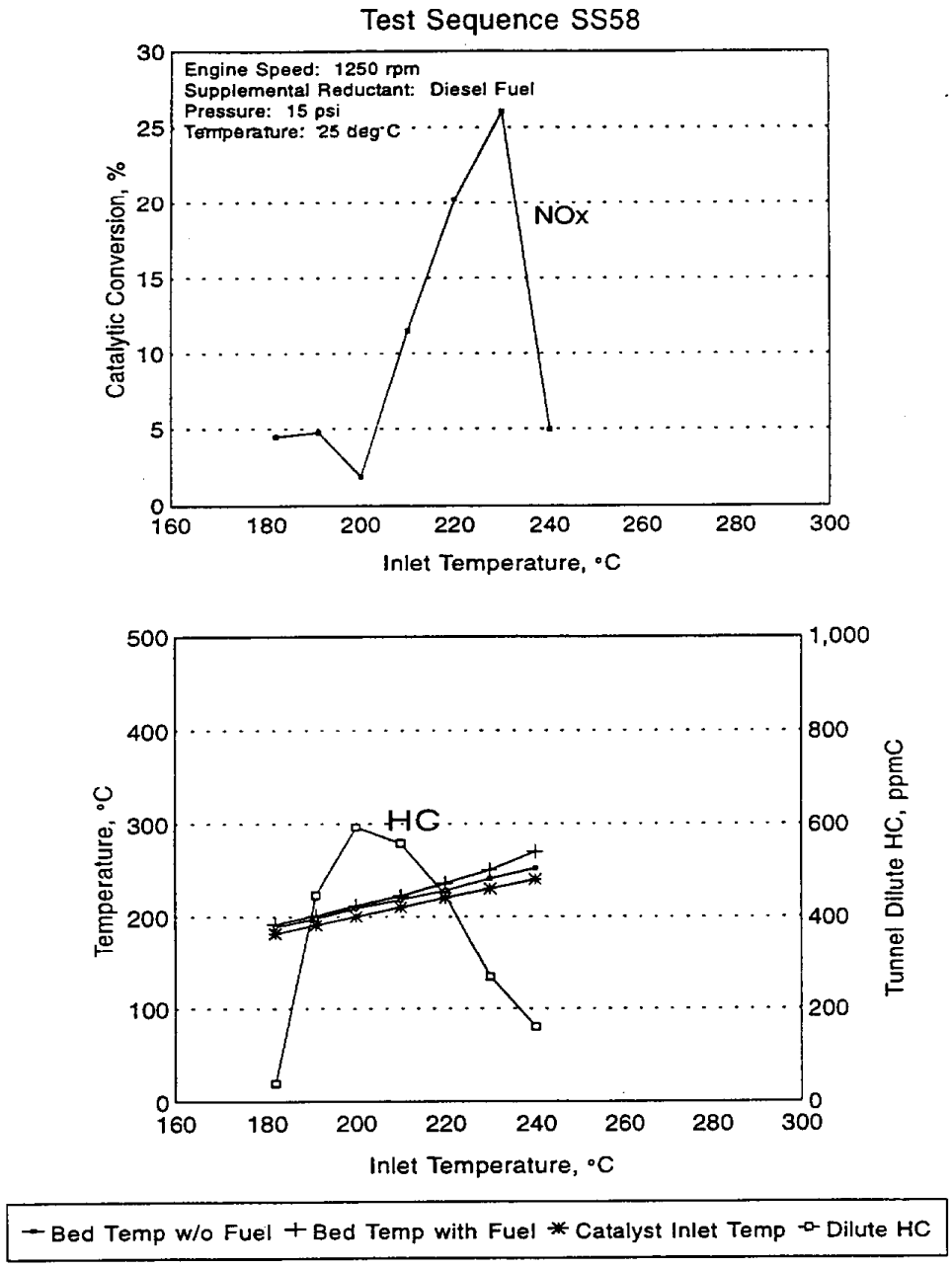

FIGURE E-2. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE – CATALYST DG-2, TEST SEQUENCE SS58

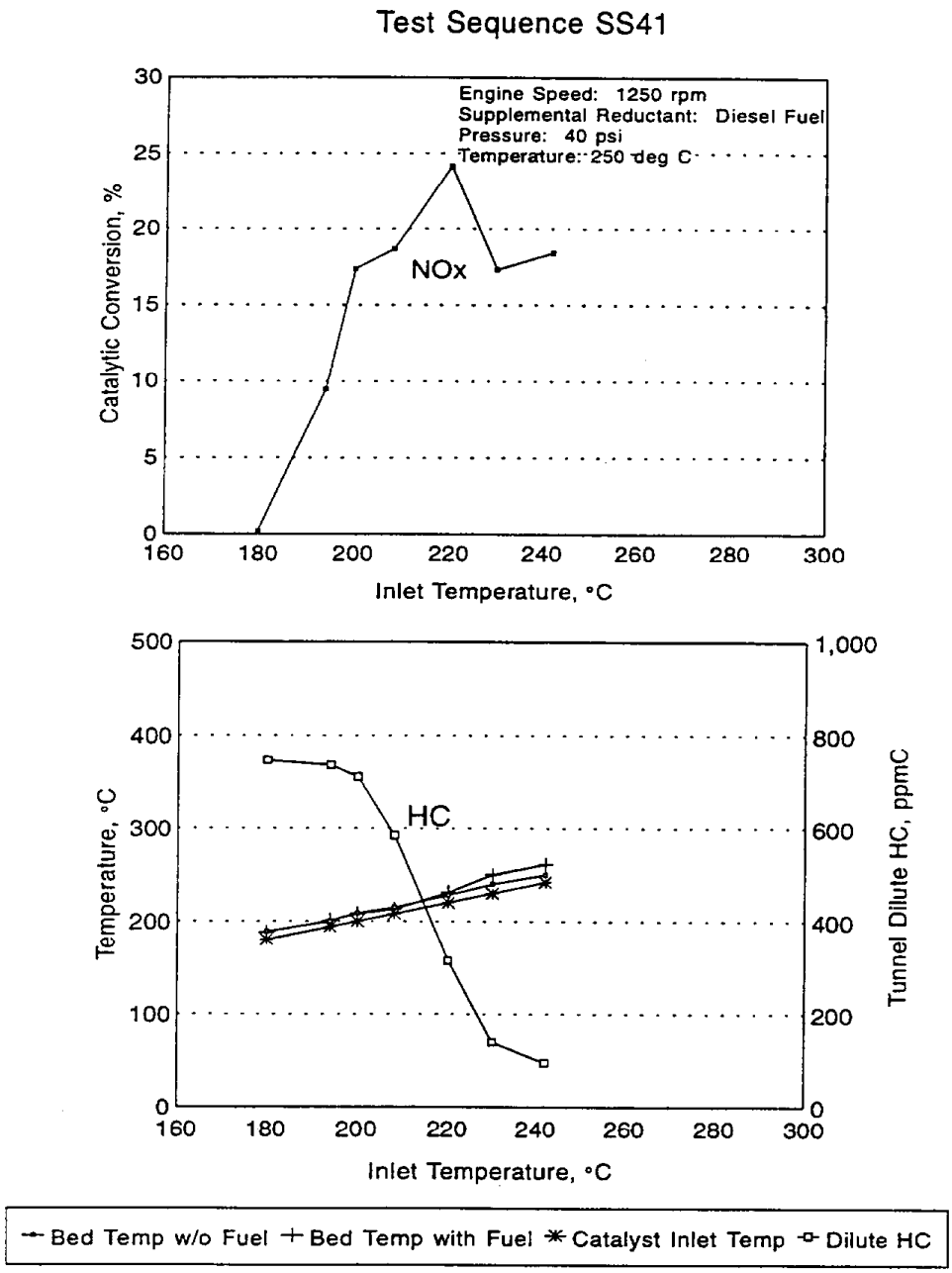

FIGURE E-3. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE -- CATALYST PS-1, TEST SEQUENCE SS41

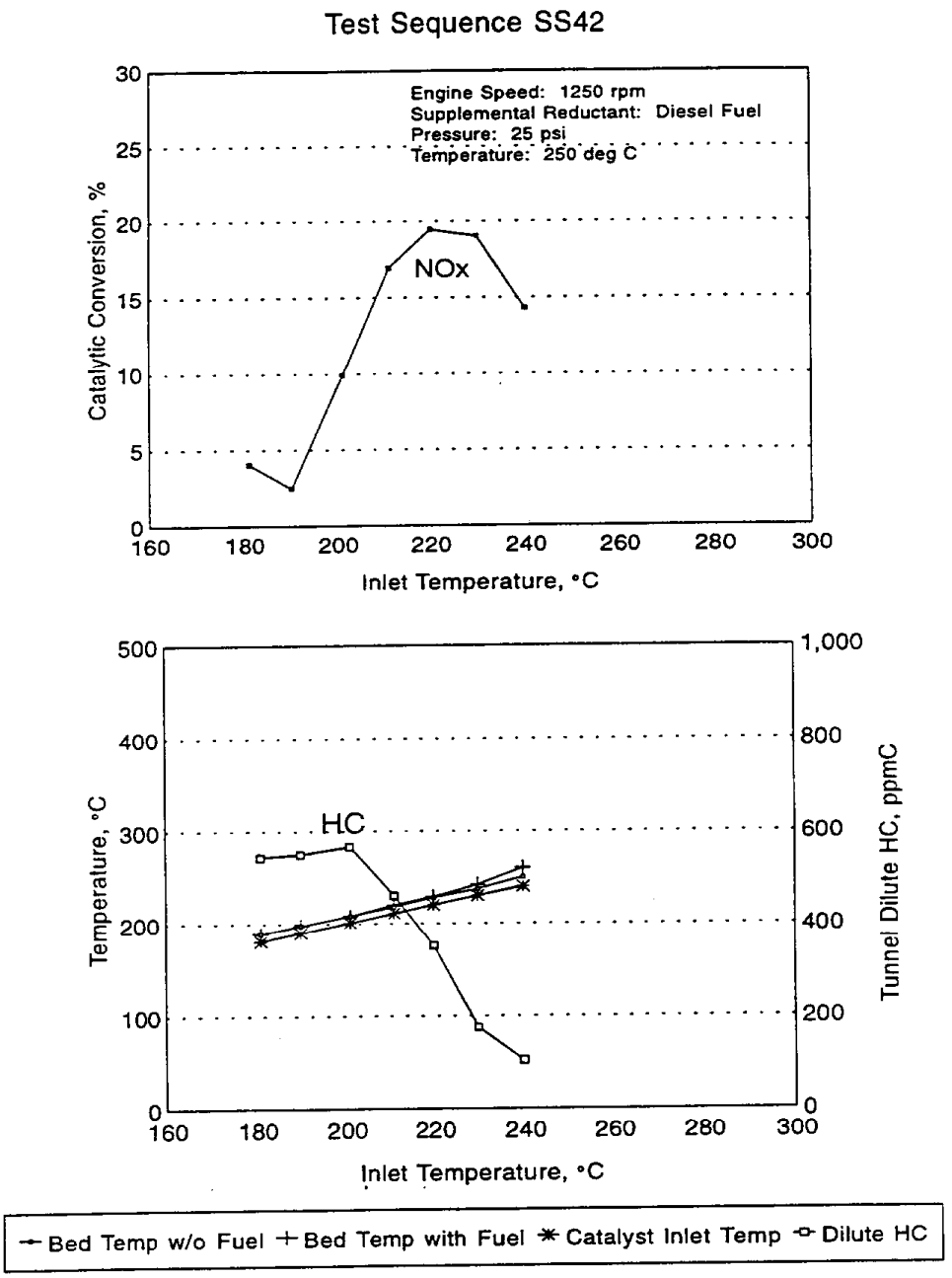

FIGURE E-4. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE – CATALYST PS-1, TEST SEQUENCE SS42

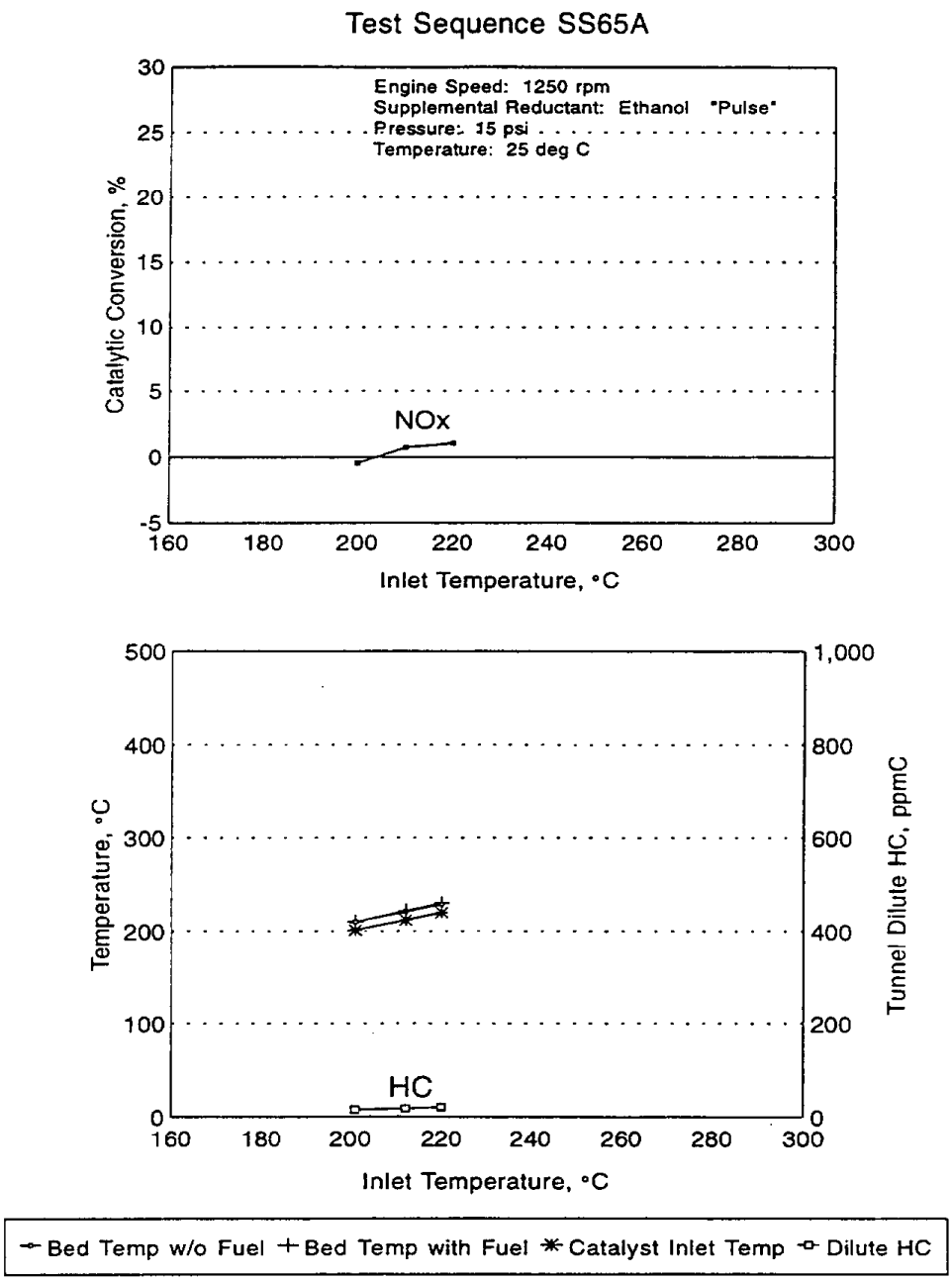

FIGURE E-5. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE – CATALYST PS-1, TEST SEQUENCE SS65A

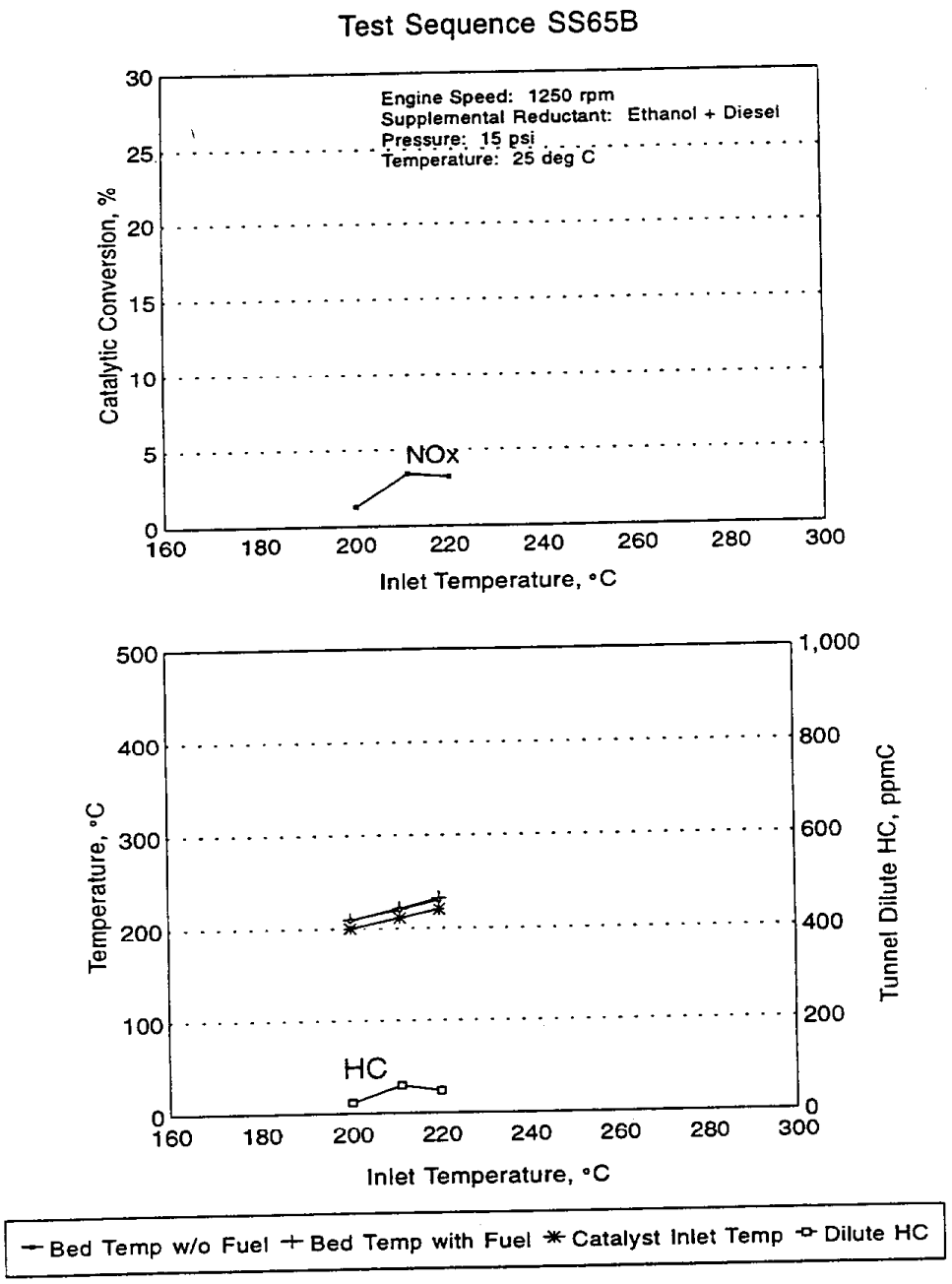

FIGURE E-6. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE – CATALYST PS-1, TEST SEQUENCE SS65B

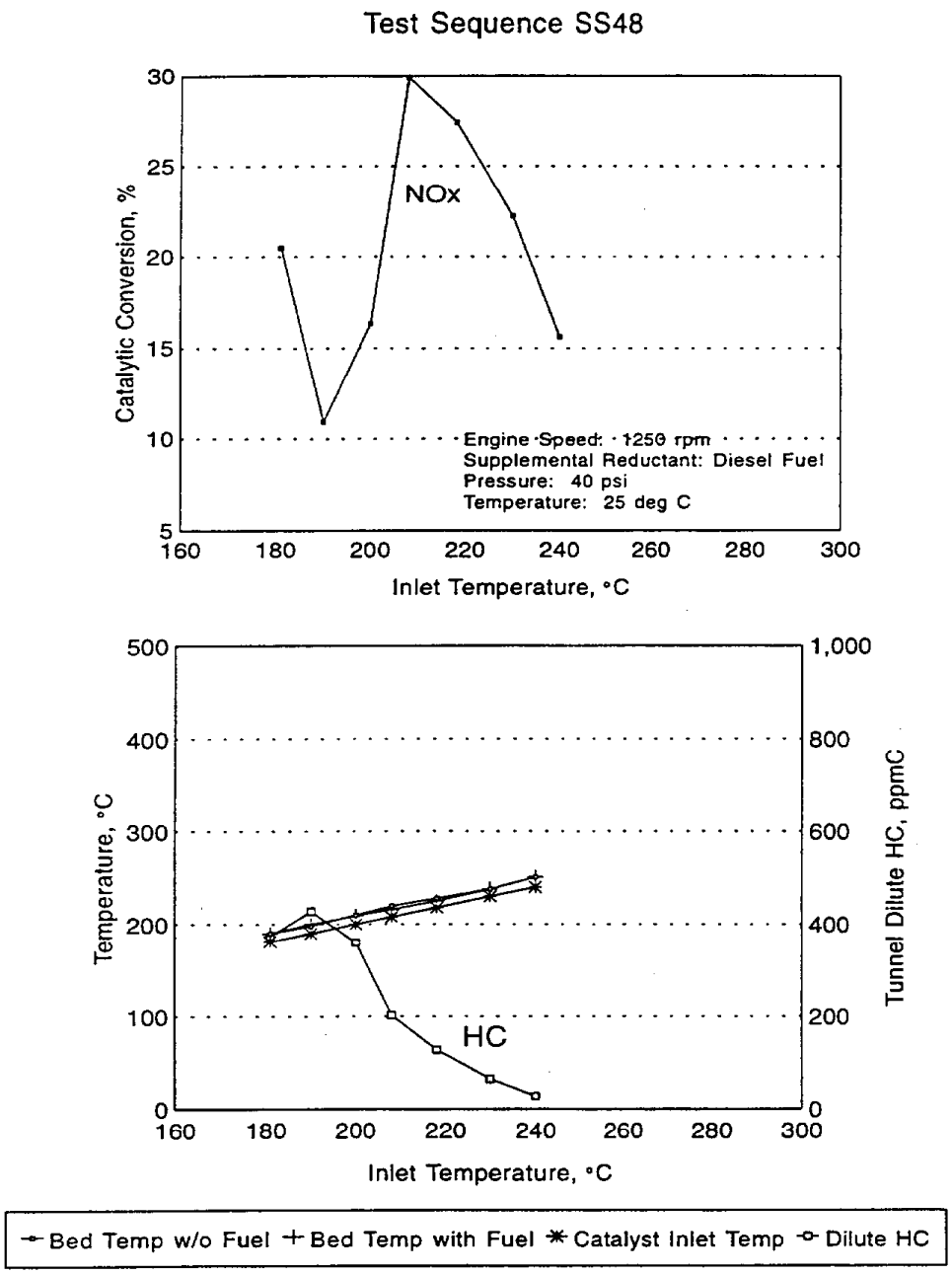

FIGURE E-7. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE – CATALYST JM-2, TEST SEQUENCE SS48

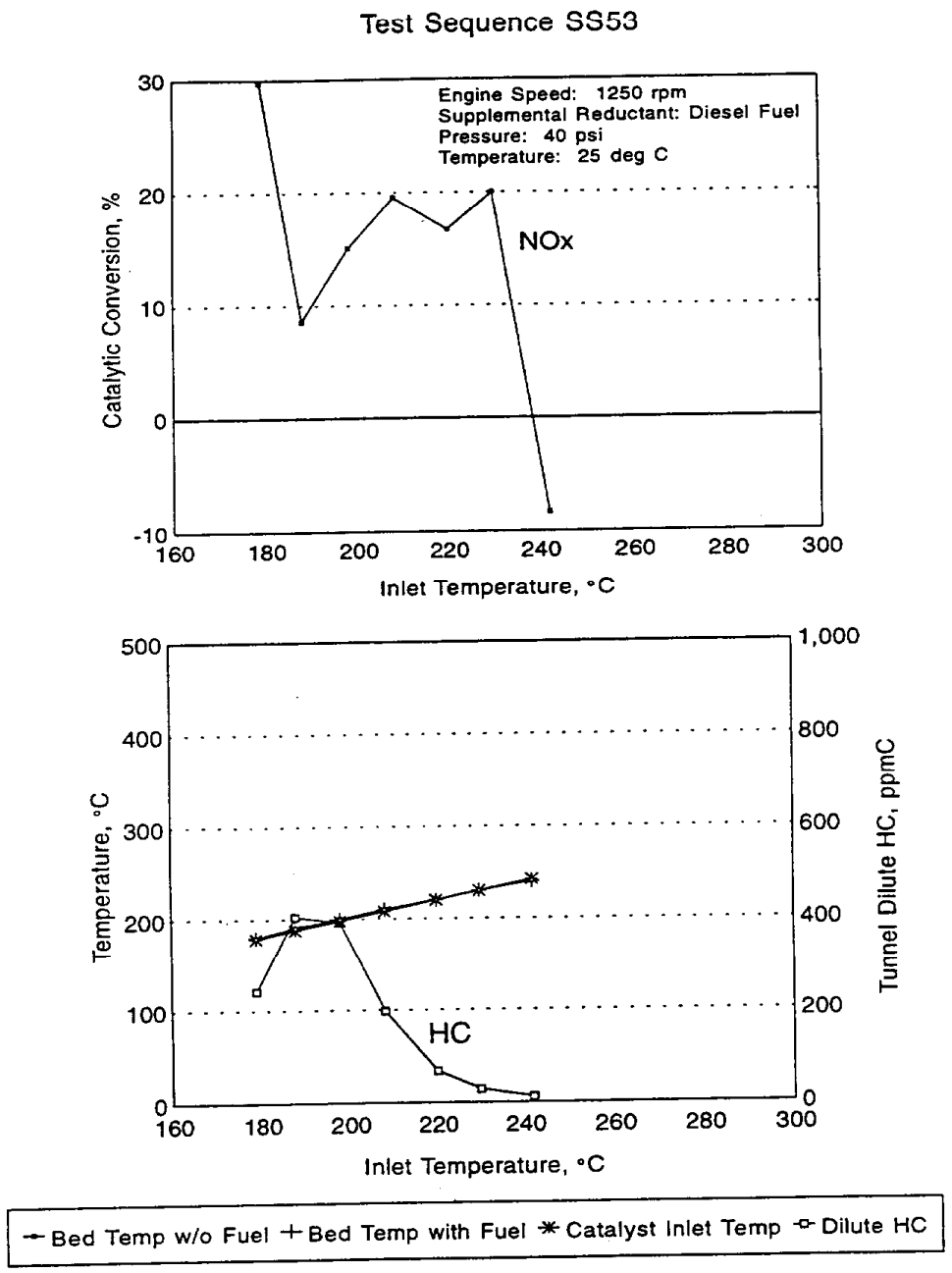

FIGURE E-8. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE – CATALYSTS JM1 + JM2, TEST SEQUENCE SS53

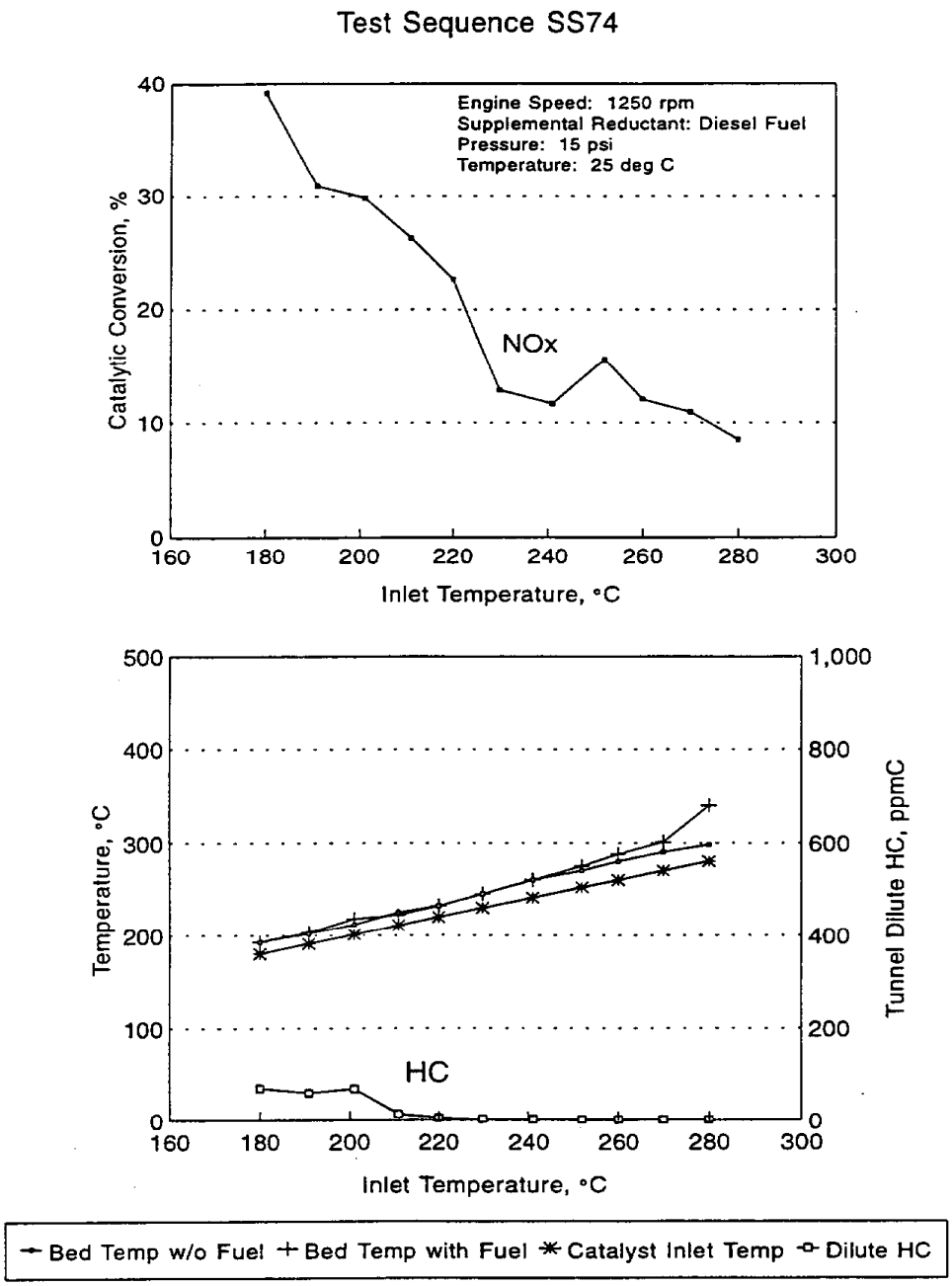

FIGURE E-9. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE -- CATALYSTS JM1 + JM2, TEST SEQUENCE SS74

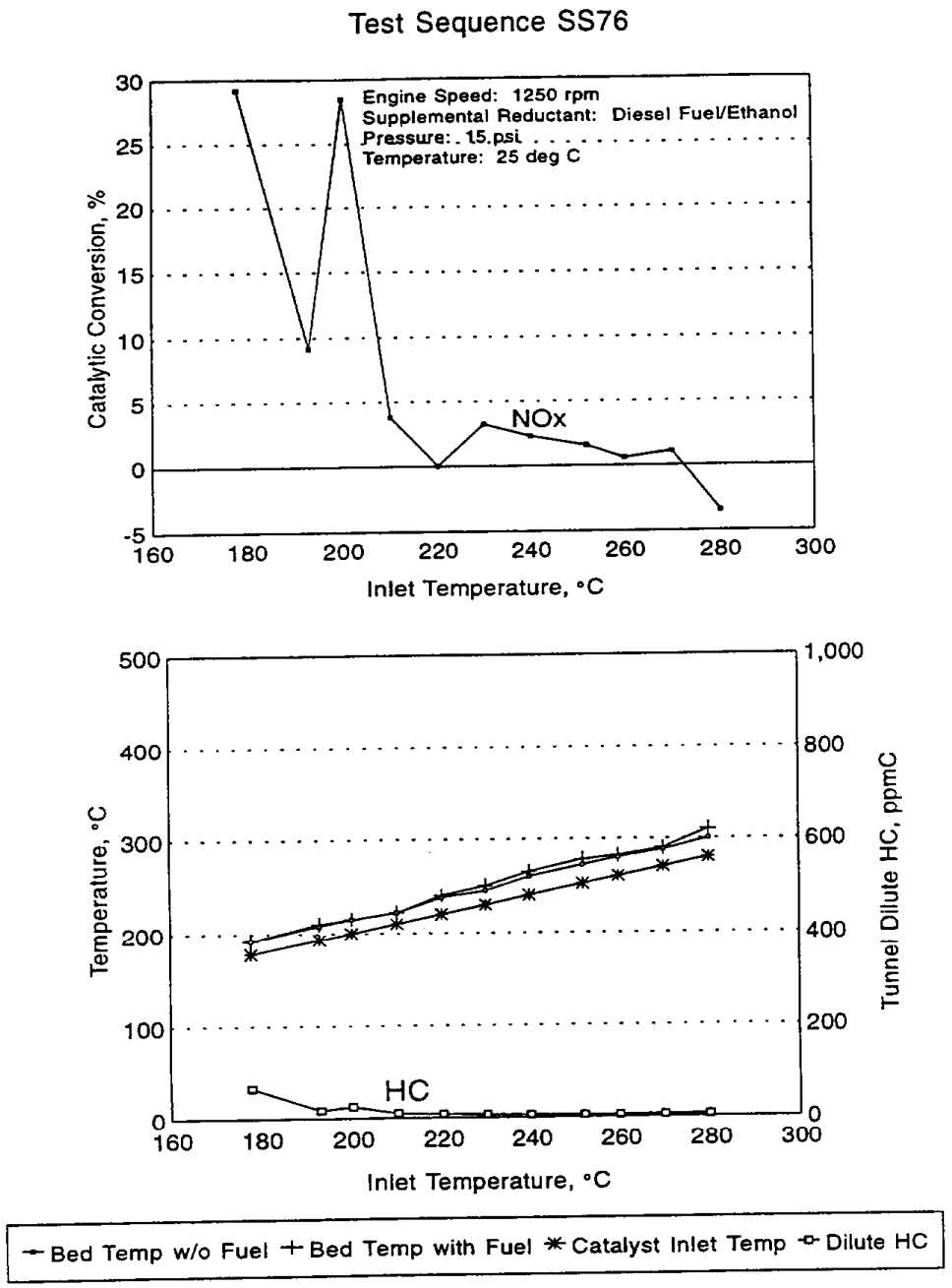

FIGURE E-10. DIESEL NO_x CATALYTIC CONVERTER PERFORMANCE -- CATALYSTS JM1 + JM2, TEST SEQUENCE SS76

APPENDIX F

STEADY-STATE TEST DILUTION TUNNEL NO_x AND HC CONCENTRATIONS FOR CATALYST GROUP "B"

- Uncoated Substrate
- Catalyst DG-2
- Catalyst PS1
- Catalyst ORP
- Catalyst JM2
- Catalyst JM1 + JM2 in Parallel
- Catalyst 220 + 221 in Series
- Catalyst NP-6

Table F-1. Emission Test Results with Uncoated Substrate

Test Sequence: SS55
Catalyst: UNC 300 (Uncoated Substrate)
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/15/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	182	No Fuel	96	225	189	44.5	17.5	-2.25
	180	Fuel	96	220	185	45.5	615	
190	190	No Fuel	116	240	198	52.0	17.5	-1.92
	193	Fuel	116	239	200	53.0	715	
200	200	No Fuel	127	250	208	56.5	17.8	-1.77
	200	Fuel	127	250	206	57.5	770	
210	212	No Fuel	140	265	219	62.5	17.1	1.60
	210	Fuel	140	262	218	61.5	765	
220	221	No Fuel	153	280	228	68.0	18.0	-1.47
	220	Fuel	154	275	228	69.0	775	
230	230	No Fuel	165	289	238	74.3	18.4	0.00
	230	Fuel	166	290	238	74.3	795	
240	240	No Fuel	177	300	248	78.5	18.5	-0.64
	240	Fuel	178	302	250	79.0	785	

Table F-2. Emission Test Results with Uncoated Substrate

Test Sequence: SS72
Catalyst: UNC 300 (Uncoated Substrate)
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/11/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
190	190	No Fuel	125	245	205	53.5	14	0.47
	190	Fuel	125	245	205	53.3	795	
200	200	No Fuel	135	258	212	59.0	22.0	-0.85
	200	Fuel	135	258	212	59.5	834	
210	210	No Fuel	148	270	223	65.0	48	0.38
	210	Fuel	148	270	223	64.8	888	
220	220	No Fuel	160	280	233	68.0	27.0	-0.37
	220	Fuel	160	280	233	68.3	852	
230	230	No Fuel	178	293	240	74.0	31.0	2.03
	230	Fuel	178	293	240	72.5	890	
240	240	No Fuel	190	305	255	78.3	22.0	0.64
	240	Fuel	190	305	255	77.8	895	
250	250	No Fuel	202	320	265	83.8	37	0.00
	250	Fuel	202	320	265	83.8	910	
260	260	No Fuel	215	331	275	88.0	32	0.00
	260	Fuel	215	331	275	88.0	920	
270	270	No Fuel	226	345	285	91.5	24	0.55
	270	Fuel	226	345	285	91.0	898	
280	280	No Fuel	243	358	298	94.8	30	0.26
	280	Fuel	243	358	298	94.5	917	

Table F-3. Emission Test Results for Catalyst DG-2

Test Sequence: SS46
Catalyst: DG-2
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/3/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	101	222	187	48.8	5.5	3.69
	181	Fuel	101	222	189	47.0	559	
190	190	No Fuel	115	236	197	50.8	15	1.57
	189	Fuel	115	236	195	50.0	675	
200	200	No Fuel	128	250	208	56.0	14.5	10.71
	200	Fuel	128	250	211	50.0	639.5	
210	210	No Fuel	139	263	218	61.0	13	26.23
	210	Fuel	139	263	220	45.0	372.5	
220	220	No Fuel	150	275	227	66.3	8.5	29.86
	219	Fuel	150	270	232	46.5	205	
230	231	No Fuel	170	292	240	74.5	8.5	23.76
	232	Fuel	170	292	263	56.8	76.5	
240	240	No Fuel	180	300	250	78.8	7	19.42
	240	Fuel	180	300	280	63.5	59	
250	250	No Fuel	191	310	260	84.0	5.5	13.10
	250	Fuel	191	310	320	73.0	50	
260	260	No Fuel	205	323	270	89.0	5.5	10.11
	260	Fuel	205	323	350	80.0	42.5	
270	270	No Fuel	220	335	280	94.0	4.5	9.57
	270	Fuel	220	335	370	85.0	37	
280	280	No Fuel	236	348	290	98.8	5.5	6.38
	280	Fuel	237	348	388	92.5	35	

Table F-4. Emission Test Results for Catalyst DG-2

Test Sequence: SS57
Catalyst: DG-2
Reductant Spray Pressure: 10 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/6/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	181	No Fuel	102	228	189	50	8	5.00
	181	Fuel	102	228	189	47.5	495	
190	190	No Fuel	111	235	197	51.3	11	1.95
	192	Fuel	111	240	200	50.3	526.5	
200	201	No Fuel	124	250	208	56.2	15	11.92
	201	Fuel	124	250	210	49.5	503	
210	210	No Fuel	137	260	217	62.5	5	29.92
	210	Fuel	137	260	223	43.8	129.5	
220	220	No Fuel	150	275	228	68.8	7	27.33
	220	Fuel	150	275	240	50.0	93	
230	230	No Fuel	166	287	238	74.0	6.5	23.65
	230	Fuel	166	287	253	56.5	67.5	
240	240	No Fuel	181	300	250	80.0	5.5	17.50
	241	Fuel	181	300	278	66.0	50	
250	250	No Fuel	191	310	260	85.0	6	15.29
	250	Fuel	191	310	305	72.0	40	
260	262	No Fuel	205	323	272	87.0	6	13.45
	262	Fuel	205	323	338	75.3	34.5	
270	272	No Fuel	222	338	283	94.0	5.2	10.96
	272	Fuel	222	338	355	83.7	29.2	
280	280	No Fuel	232	345	290	97.5	5	10.26
	280	Fuel	232	345	363	87.5	27.2	
290	290	No Fuel	250	362	302	103.7	5	8.87
	290	Fuel	250	362	375	94.5	25	
300	300	No Fuel	262	370	311	106.3	4.5	3.57
	300	Fuel	262	370	383	102.5	25	

Table F-5. Emission Test Results with Catalyst DG2

Test Sequence: SS58
Catalyst: DG2
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/17/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	181	No Fuel	101	228	189	50.5	6.0	4.51
	182	Fuel	101	228	192	48.3	39.4	
190	191	No Fuel	114	231	198	52.5	9.5	4.76
	191	Fuel	114	235	201	50.0	446.0	
200	200	No Fuel	126	245	209	57.3	11.0	1.88
	200	Fuel	126	245	212	56.3	592.5	
210	210	No Fuel	138	261	218	62.9	14.8	11.50
	210	Fuel	138	260	222	55.7	557.5	
220	220	No Fuel	149	272	228	68.3	10.5	20.24
	220	Fuel	149	275	236	54.5	447.2	
230	230	No Fuel	166	290	241	73.5	9.5	26.03
	230	Fuel	166	290	250	54.3	269.3	
240	241	No Fuel	178	300	252	78.8	6.0	4.97
	240	Fuel	178	300	270	74.9	160.8	

Table F-6. Emission Test Results with DG-2

Test Sequence: SS67
Catalyst: DG-2
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Ethanol + Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/6/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	170	No Fuel	98	215	188	43.3	8.5	3.47
	170	Fuel	98	215	188	41.8	356.5	
190	192	No Fuel	130	245	201	56.0	9.5	9.82
	195	Fuel	130	245	205	50.5	238	
200	200	No Fuel	136	251	209	58.0	9.5	23.71
	200	Fuel	136	251	209	44.3	300	
210	210	No Fuel	155	265	218	63.0	11.5	25.79
	210	Fuel	155	265	221	46.8	135	
220	220	No Fuel	167	285	230	68.8	16.0	16.73
	220	Fuel	167	286	245	57.3	39	
230	230	No Fuel	174	295	242	72.0	9.5	14.58
	230	Fuel	174	295	270	61.5	29	
240	240	No Fuel	185	305	252	77.8	8.0	9.32
	240	Fuel	185	305	275	70.5	25	
250	250	No Fuel	200	320	260	84.0	6	5.95
	250	Fuel	200	320	270	79.0	13.5	
260	260	No Fuel	217	332	272	89.3	6	2.52
	262	Fuel	217	332	282	87.0	10	
270	272	No Fuel	233	345	285	94.0	5.5	1.33
	273	Fuel	233	345	292	92.8	8.5	
280	280	No Fuel	243	355	292	97.5	5	2.05
	280	Fuel	243	355	300	95.5	8	

Table F-7. Emission Test Results with DG-2

Test Sequence: SS68
Catalyst: DG-2
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Ethanol
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/7/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	102	230	190	46.0	9.0	12.50
	182	Fuel	106	240	198	40.3	195	
190	191	No Fuel	114	245	200	53.3	13	17.84
	191	Fuel	114	245	210	43.8	169.5	
200	200	No Fuel	127	260	210	59.0	12.0	15.25
	200	Fuel	127	260	230	50.0	146	
210	210	No Fuel	147	270	220	64.0	12	17.19
	210	Fuel	147	270	240	53.0	135	
220	220	No Fuel	157	290	230	69.8	11.5	6.09
	221	Fuel	157	290	240	65.5	38	
230	230	No Fuel	167	300	240	74.3	10.5	4.04
	230	Fuel	167	300	248	71.3	28	
240	240	No Fuel	185	310	252	79.8	10.5	0.94
	240	Fuel	185	310	255	79.0	15	
250	250	No Fuel	199	320	262	85.0	5.5	1.47
	250	Fuel	199	320	265	83.8	9	
260	260	No Fuel	211	335	272	90.0	5.5	1.39
	260	Fuel	211	335	275	88.8	7	
270	270	No Fuel	220	342	281	92.3	5	0.81
	270	Fuel	220	342	282	91.5	6	
280	280	No Fuel	230	360	295	98.3	4.5	1.27
	280	Fuel	230	360	300	97.0	5	

Table F-8. Emission Test Results with Catalyst PS-1

Test Sequence: SS41
Catalyst: PS-1
Reductant Spray Pressure: 40 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/1/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	181	No Fuel	100		189	46.3	5	0.22
	180	Fuel	100		188	46.2	745	
190	193	No Fuel	119		200	53.8	16	9.48
	194	Fuel	119		201	48.7	735	
200	201	No Fuel	127		209	57.5	13	17.39
	200	Fuel	127		208	47.5	710	
210	210	No Fuel	135		215	60.0	13	18.67
	208	Fuel	135		213	48.8	585	
220	220	No Fuel	150		228	67.5	11.5	24.15
	220	Fuel	150		231	51.2	315	
230	230	No Fuel	167		240	71.0	16	17.32
	230	Fuel	167		250	58.7	140	
240	242	No Fuel	177		250	76.0	9	18.42
	242	Fuel	177		261	62.0	95	

Table F-9. Emission Test Results with Catalyst PS-1

Test Sequence: SS42
Catalyst: PS-1
Reductant Spray Pressure: 25 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/2/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	181	No Fuel	103	220	189	49.5	7.2	4.04
	181	Fuel	103	220	189	47.5	543.5	
190	190	No Fuel	115	235	198	52.5	15.5	2.48
	190	Fuel	115	235	198	51.2	549.5	
200	200	No Fuel	126	248	208	57.5	10.5	9.91
	201	Fuel	126	248	208	51.8	566	
210	211	No Fuel	139	262	218	63.2	12	16.93
	211	Fuel	139	262	220	52.5	460	
220	220	No Fuel	150	275	228	66.8	13	19.46
	220	Fuel	150	275	229	53.8	352	
230	230	No Fuel	164	288	237	72.5	12	19.03
	230	Fuel	164	288	242	58.7	175	
240	240	No Fuel	181	300	250	74.7	11.5	14.32
	240	Fuel	181	301	260	64.0	104	

Table F-10. Emission Test Results with Catalyst PS-1

Test Sequence: SS60
Catalyst: PS-1
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/20/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	110	220	186	46.3	7	7.57
	179	Fuel	110	220	185	42.8	470	
190	192	No Fuel	128	241	200	56.3	8.5	12.00
	192	Fuel	128	241	202	49.5	500	
200	201	No Fuel	138	252	211	60.3	9	14.11
	203	Fuel	138	253	213	51.8	585	
210	210	No Fuel	142	259	218	62.5	12	19.60
	210	Fuel	142	259	218	50.3	450	
220	220	No Fuel	157	272	228	68.8	9	21.82
	220	Fuel	157	273	232	53.8	418	
230	230	No Fuel	172	288	240	75.0	10	20.00
	230	Fuel	172	289	246	60.0	223.5	
240	240	No Fuel	187	302	250	80.0	7.5	15.00
	242	Fuel	187	305	265	68.0	155	

Table F-11. Emission Test Results with PS-1

Test Sequence: SS61
Catalyst: PS-1
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel + Toluene
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/21/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	110	223	189	48.8	6.0	-2.56
	180	Fuel	110	223	190	50.0	725	
190	193	No Fuel	120	240	201	53.8	9.5	4.19
	193	Fuel	120	240	200	51.5	730	
200	200	No Fuel	127	250	210	57.5	17.0	6.52
	200	Fuel	127	250	210	53.8	733	
210	210	No Fuel	140	262	220	61.3	22.5	11.43
	210	Fuel	140	263	221	54.3	665	
220	220	No Fuel	155	280	231	67.5	17.5	17.04
	221	Fuel	155	280	234	56.0	438	
230	233	No Fuel	168	295	245	75.0	9.0	18.33
	233	Fuel	168	295	250	61.3	281	
240	242	No Fuel	177	301	252	77.5	6.0	16.13
	242	Fuel	177	301	263	65.0	87	
250	250	No Fuel	190	315	262	83.8	5.5	10.45
	250	Fuel	190	315	277	75.0	60	
260	260	No Fuel	200	325	272	88.8	5	7.04
	260	Fuel	200	325	295	82.5	45.5	
270	270	No Fuel	220	338	282	92.5	4.5	4.73
	270	Fuel	220	338	320	88.1	40	
280	280	No Fuel	233	350	293	97.5	4.5	3.85
	280	Fuel	233	350	340	93.8	36	

Table F-12. Emission Test Results with PS-1

Test Sequence: SS65
Catalyst: PS-1
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Ethanol
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/5/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	182	No Fuel	98	232	190	51.3	12.5	7.32
	180	Fuel	98	235	189	47.5	295	
190	190	No Fuel	115	250	200	56.8	16.5	5.73
	191	Fuel	115	250	202	53.5	265	
200	200	No Fuel	128	261	210	61.3	15.0	10.20
	200	Fuel	128	261	213	55.0	250	
210	210	No Fuel	140	270	218	66.3	14.5	9.43
	210	Fuel	140	270	228	60.0	195	
220	220	No Fuel	155	288	230	72.5	13.5	8.62
	220	Fuel	155	288	242	66.3	180	
230	230	No Fuel	175	300	240	77.5	12.5	1.61
	230	Fuel	175	300	245	76.3	53	
240	240	No Fuel	192	315	252	83.0	9.0	-0.60
	240	Fuel	192	315	255	83.5	16	
250	251	No Fuel	212	330	262	88.8	7.5	0.56
	252	Fuel	212	330	265	88.3	14	
260	261	No Fuel	225	340	275	93.5	7	0.27
	261	Fuel	225	340	275	93.3	12.5	
270	270	No Fuel	235	350	285	96.8	8.5	0.00
	270	Fuel	235	350	288	96.8	11	
280	280	No Fuel	255	362	295	100.0	6	0.25
	280	Fuel	255	362	295	99.8	8.5	

Table F-13. Emission Test Results with PS-1

Test Sequence: SS65A
Catalyst: PS-1
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Ethanol "Pulse"
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/5/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
200	201	No Fuel	140	260	210	58.0	7.5	-0.43
	201	Fuel	140	260	210	58.3	15.5	
210	212	No Fuel	156	275	221	65.5	9	0.76
	212	Fuel	156	275	222	65.0	18	
220	220	No Fuel	168	282	229	70.0	12.5	1.07
	220	Fuel	168	282	230	69.3	21	

Table F-14. Emission Test Results with PS-1

Test Sequence: SS65B
Catalyst: PS-1
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Ethanol + Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/5/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
200	200	No Fuel	142	258	209	58.8	9.0	1.28
	200	Fuel	142	258	209	58.0	23	
210	210	No Fuel	160	270	220	65.5	12.5	3.44
	211	Fuel	160	270	221	63.3	60	
220	220	No Fuel	169	280	230	69.5	12.0	3.24
	220	Fuel	169	280	232	67.3	48	

Table F-15. Emission Test Results with ORP

Test Sequence: SS79
Catalyst: ORP
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Ethanol
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/24/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	130	235	195	48.8	5.5	12.91
	180	Fuel	130	235	198	42.5	180	
190	190	No Fuel	140	249	208	53.8	9.0	11.71
	190	Fuel	140	249	212	47.5	207.5	
200	201	No Fuel	154	266	219	60.8	11.0	12.83
	201	Fuel	154	260	235	53.0	130.0	
210	210	No Fuel	160	270	228	63.0	6.5	8.73
	210	Fuel	160	270	229	57.5	40.0	
220	220	No Fuel	167	282	235	66.5	6.0	12.48
	220	Fuel	167	282	245	58.2	65.0	
230	230	No Fuel	184	299	248	72.8	7.5	1.10
	230	Fuel	184	299	249	72.0	12.0	
240	240	No Fuel	197	311	257	77.3	6.5	1.42
	240	Fuel	197	311	270	76.2	60.0	
250	250	No Fuel	210	323	270	82.5	7.5	0.61
	250	Fuel	210	323	270	82.0	10.5	
260	260	No Fuel	217	335	278	86.5	6.5	0.00
	260	Fuel	217	335	280	86.5	9.0	
270	270	No Fuel	230	347	288	91.5	5.5	0.77
	270	Fuel	230	347	290	90.8	7.0	
280	280	No Fuel	250	360	300	95.5	5.0	-0.73
	280	Fuel	250	360	302	96.2	5.5	

Table F-16. Emission Test Results with ORP

Test Sequence: SS80
Catalyst: ORP
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/25/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	192	No Fuel	130	252	208	57.5	7.0	4.87
	192	Fuel	130	252	208	54.7	570	
190	200	No Fuel	143	260	215	56.8	14.0	-1.23
	200	Fuel	143	260	215	57.5	806	
200	209	No Fuel	154	270	226	62.5	12.0	15.20
	209	Fuel	154	270	226	53.0	430.0	
210	220	No Fuel	167	290	238	69.5	8.0	18.71
	220	Fuel	167	290	238	56.5	394.0	
220	230	No Fuel	179	305	252	74.5	9.0	19.46
	230	Fuel	179	305	252	60.0	200.0	
230	240	No Fuel	191	315	260	78.5	8.0	16.18
	240	Fuel	191	315	270	65.8	171.0	
240	250	No Fuel	202	328	272	85.5	4.0	17.31
	250	Fuel	202	328	290	70.7	85.0	
250	260	No Fuel	219	340	282	88.8	4.0	13.29
	260	Fuel	219	340	335	77.0	41.5	
260	270	No Fuel	234	352	295	93.7	4.0	10.89
	270	Fuel	234	352	387	83.5	25.0	
270	281	No Fuel	250	368	303	98.0	3.0	8.16
	281	Fuel	250	368	410	90.0	17.0	

Table F-17. Emission Test Results for Catalyst JM-2

Test Sequence: SS48
Catalyst: JM-2
Reductant Fuel Spray Pressure: 40 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 1/30/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	181	No Fuel	102	223	190	48.8	3	20.49
	181	Fuel	102	223	190	38.8	373	
190	190	No Fuel	116	235	198	51.3	9	10.92
	190	Fuel	116	235	200	45.7	428	
200	201	No Fuel	125	245	210	55.0	10.5	16.36
	200	Fuel	125	245	209	46.0	360	
210	211	No Fuel	138	255	220	62.5	8	29.92
	208	Fuel	138	255	216	43.8	203	
220	220	No Fuel	147	270	228	63.8	8	27.43
	218	Fuel	147	270	225	46.3	128	
230	230	No Fuel	165	288	238	68.8	8	22.24
	230	Fuel	165	290	238	53.5	64.5	
240	241	No Fuel	180	305	251	75.5	6	15.63
	240	Fuel	180	302	251	63.7	27.5	

Table F-18. Emission Test Results for Catalyst JM-2

Test Sequence: SS49
Catalyst: JM-2
Reductant Spray Pressure: 40 psi
Supplementary Reductant: Diesel Fuel
Heated Fuel: 150 deg C
Nozzle: LNN 0.60 SS
Engine Speed: 1250 rpm

Test Date: 1/31/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	104		189	49.5	4	15.56
	181	Fuel	104		190	41.8	470	
190	190	No Fuel	117		199	52.5	9.5	9.52
	192	Fuel	117		200	47.5	520	
200	201	No Fuel	127		210	55.5	11	10.81
	201	Fuel	127		209	49.5	622.5	
210	210	No Fuel	139		220	61.8	8	25.08
	211	Fuel	139		220	46.3	374	
220	219	No Fuel	150		228	65.2	7	25.61
	220	Fuel	150		228	48.5	235	
230	230	No Fuel	167		239	68.5	8.5	19.71
	230	Fuel	167		239	55.0	92	
240	240	No Fuel	181		250	73.0	5	13.70
	240	Fuel	181		250	63.0	28	

Table F-19 . Emission Test Results for Catalyst JM1 + Catalyst JM2

Test Sequence: SS53
Catalyst: JM-1 + JM-2
Reductant Spray Pressure: 40 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/10/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	100	222	180	46.25	4.5	29.73
	179	Fuel	100	222	180	32.5	242	
190	190	No Fuel	119	235	191	43.8	7.5	8.57
	188	Fuel	119	240	190	40.0	405	
200	199	No Fuel	129	250	200	50.0	11.5	15.00
	198	Fuel	129	250	200	42.5	392.5	
210	210	No Fuel	142	263	210	57.5	8	19.57
	208	Fuel	142	263	210	46.3	197	
220	220	No Fuel	155	277	220	60.0	8	16.67
	220	Fuel	155	277	220	50.0	68	
230	232	No Fuel	169	292	230	68.8	5	20.00
	230	Fuel	169	292	230	55.0	28.8	
240	240	No Fuel	181	301	240	60.0	4.5	-8.33
	242	Fuel	181	301	240	65.0	12.5	

Table F-20. Emission Test Results with JM1+JM2

Test Sequence: SS74
Catalyst: JM1+JM2
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/13/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	114	238	193	48.5	2.0	39.18
	180	Fuel	114	238	193	29.5	70	
190	191	No Fuel	135	258	202	51.8	3.5	30.92
	191	Fuel	135	258	203	35.8	60	
200	201	No Fuel	146	272	212	57.0	4.5	29.82
	201	Fuel	146	272	218	40.0	69	
210	211	No Fuel	155	282	225	60.0	3.5	26.25
	211	Fuel	155	282	222	44.3	14	
220	220	No Fuel	167	292	232	65.3	3.5	22.61
	220	Fuel	167	292	232	50.5	6.0	
230	230	No Fuel	185	310	245	66.0	3.0	12.88
	230	Fuel	185	310	245	57.5	3.5	
240	241	No Fuel	200	325	260	75.0	3.0	11.67
	241	Fuel	200	325	260	66.3	2.5	
250	252	No Fuel	213	340	270	83.5	2.0	15.57
	252	Fuel	213	340	275	70.5	2.0	
260	260	No Fuel	228	350	280	87.0	2.0	12.07
	260	Fuel	228	350	288	76.5	2.0	
270	270	No Fuel	242	360	290	91.3	2.0	10.96
	270	Fuel	242	360	301	81.3	2.0	
280	280	No Fuel	253	368	298	93.8	2.0	8.53
	280	Fuel	253	368	340	85.8	2.0	

Table F-21. Emission Test Results with JM1+JM2

Test Sequence: SS75
Catalyst: JM1+JM2 in parallel
Reductant Spray Pressure: 40 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/14/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	175	No Fuel	105	230	188	44.5	3.8	43.82
	175	Fuel	105	230	188	25	70	
190	190	No Fuel	129	254	203	54.0	3.5	32.87
	190	Fuel	129	254	203	36.3	176	
200	201	No Fuel	145	272	215	53.8	6.0	14.42
	201	Fuel	145	272	215	46.0	335	
210	210	No Fuel	157	282	223	56.0	7	8.93
	210	Fuel	157	282	223	51.0	62.5	
220	220	No Fuel	175	299	235	61.3	4.5	6.12
	220	Fuel	175	299	235	57.5	16.5	
230	231	No Fuel	190	311	248	66.3	4.0	3.77
	231	Fuel	190	311	250	63.8	4.5	
240	240	No Fuel	203	323	260	75.0	4.0	14.00
	240	Fuel	203	323	257	64.5	4	
250	250	No Fuel	212	332	270	81.0	4.0	14.20
	250	Fuel	212	332	268	69.5	4.0	
260	260	No Fuel	229	348	280	85.0	4.0	9.71
	260	Fuel	229	348	279	76.8	4.0	
270	270	No Fuel	243	360	290	90.0	4.0	8.89
	270	Fuel	243	360	292	82.0	4.0	
280	280	No Fuel	258	370	300	93.0	4.0	6.45
	280	Fuel	258	370	302	87.0	4.0	

Table F-22. Emission Test Results with JM1 + JM2

Test Sequence: SS76
Catalyst: JM1+JM2 in parallel
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Diesel Fuel/Ethanol
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/17/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	178	No Fuel	115	240	192	45.2	5.5	29.20
	178	Fuel	115	240	192	32	66.0	
190	193	No Fuel	125	260	208	52.3	12.5	9.18
	193	Fuel	125	260	210	47.5	17.5	
200	200	No Fuel	145	270	215	55.5	11.5	28.47
	200	Fuel	145	270	215	39.7 *	25.0	
210	210	No Fuel	163	282	222	57.7	9.0	3.81
	210	Fuel	163	282	222	55.5	10.5	
220	220	No Fuel	175	300	238	63.8	9.0	0.00
	220	Fuel	175	300	240	63.8	8.5	
230	230	No Fuel	185	310	245	71.3	6.5	3.23
	230	Fuel	185	310	250	69.0	6.5	
240	240	No Fuel	196	330	260	78.8	6.0	2.28
	240	Fuel	196	330	265	77.0	6.0	
250	252	No Fuel	209	342	272	84.5	5.5	1.54
	252	Fuel	209	342	278	83.2	5.0	
260	260	No Fuel	230	350	280	87.0	5.5	0.57
	260	Fuel	230	350	282	86.5	5.0	
270	270	No Fuel	240	362	288	91.5	5.5	1.09
	270	Fuel	240	362	290	90.5	5.5	
280	280	No Fuel	260	378	300	92.8	5.0	-3.45
	280	Fuel	260	378	310	96.0	5.5	

*Dilute NOx measurement of 39.7 ppm with reductant spray injection appears to be real. Possibly high levels of NOx reduction are maintainable at 200 deg. C.

Table F-23. Emission Test Results with JM1+JM2

Test Sequence: SS77
Catalyst: JM1+JM2 in parallel
Reductant Spray Pressure: 15 psi
Supplementary Reductant: Ethanol
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/19/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	182	No Fuel	135	248	198	49.5	4.5	30.30
	182	Fuel	135	250	200	34.5	100	
190	193	No Fuel	150	258	210	53.0	9.0	28.30
	193	Fuel	150	258	209	38.0	120	
200	204	No Fuel	160	275	220	59.0	7.0	24.07
	204	Fuel	160	275	220	44.8	36.0	
210	211	No Fuel	167	290	230	63.5	5.5	21.57
	211	Fuel	167	290	251	49.8	84.5	
220	220	No Fuel	184	300	240	68.7	5.5	18.49
	220	Fuel	184	300	270	56.0	12.0	
230	230	No Fuel	200	315	250	74.5	4.0	15.03
	230	Fuel	200	315	298	63.3	31.0	
240	242	No Fuel	218	330	262	80.0	4.0	10.00
	242	Fuel	218	330	322	72.0	10.0	
250	250	No Fuel	227	338	270	83.2	3.5	8.41
	250	Fuel	227	338	289	76.2	4.5	
260	260	No Fuel	238	350	280	87.2	4.0	-0.34
	260	Fuel	238	350	283	87.5	3.5	
270	270	No Fuel	249	365	291	92.5	3.5	1.41
	270	Fuel	249	365	295	91.2	3.5	
280	280	No Fuel	265	380	302	97.0	3.5	0.31
	280	Fuel	265	380	307	96.7	3.5	

Table F-24. Emission Test Results with 220+221 in Series

Test Sequence: SS82
Catalyst: 220+221 in Series
Reductant Spray Pressure: 20 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/26/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	180	No Fuel	108	232	191	46.5	10.5	0.00
	180	Fuel	108	232	190	46.5	731.5	
200	203	No Fuel	137	265	219	59.7	21.0	1.51
	203	Fuel	137	265	218	58.8	731.5	
220	220	No Fuel	162	290	235	66.7	24.5	-0.15
	220	Fuel	162	290	235	66.8	732.0	
240	240	No Fuel	186	315	260	78.3	3.0	9.32
	240	Fuel	186	315	258	71.0	870.0	
260	263	No Fuel	216	345	282	87.8	4.0	17.43
	263	Fuel	216	345	281	72.5	189.0	
280	280	No Fuel	246	360	298	93.0	2.0	11.08
	280	Fuel	246	360	298	82.7	66.0	
300	300	No Fuel	262	385	320	101.3	4.0	7.50
	300	Fuel	262	385	318	93.7	45.0	
320	320	No Fuel	305	413	340	111.5	3.6	3.86
	320	Fuel	305	413	340	107.2	42.6	
340	340	No Fuel	335	435	360	117.0	3.7	1.11
	340	Fuel	335	435	362	115.7	40.9	
360	362	No Fuel	370	440	385	124.0	3.6	0.81
	362	Fuel	370	440	390	123.0	41.5	
380	380	No Fuel	402	460	400	131.3	3.6	0.99
	380	Fuel	402	460	408	130.0	40.5	
400	400	No Fuel	462	500	422	142.5	3.4	1.26
	400	Fuel	462	500	435	140.7	31.7	
420	420	No Fuel	507	540	445	150.7	3.5	1.13
	420	Fuel	507	540	467	149.0	18.3	
440	440	No Fuel	570	585	468	159.0	4.2	0.31
	440	Fuel	570	585	495	158.5	13.6	

Table F-25. Emission Test Results with 220+221 in Series

Test Sequence: SS83
Catalyst: 220+221 in Series
Reductant Spray Pressure: 20 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 4/27/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
220	221	No Fuel	162	282	235	68.7	6.0	1.75
	221	Fuel	162	282	233	67.5	860.0	
240	240	No Fuel	185	310	258	77.0	8.0	6.10
	240	Fuel	185	310	255	72.3	900.0	
260	260	No Fuel	220	338	279	86.8	9.0	15.55
	260	Fuel	220	338	278	73.3	360.0	
280	280	No Fuel	239	358	298	94.5	3.5	10.58
	280	Fuel	239	358	298	84.5	72.0	
300	300	No Fuel	270	388	321	104.0	3.2	6.73
	300	Fuel	270	388	321	97.0	44.0	
320	320	No Fuel	300	410	338	111.5	2.6	4.48
	320	Fuel	300	410	340	106.5	42.7	
340	340	No Fuel	337	415	360	119.2	2.4	2.52
	340	Fuel	337	415	368	116.2	39.8	
360	360	No Fuel	377	435	382	126.3	2.8	1.98
	360	Fuel	377	435	393	123.8	39.7	

Table F-26. Emission Test Results with Catalyst NP-6

Test Sequence: SS51
Catalyst: NP-6
Reductant Spray Pressure: 25 psi
Supplementary Reductant: Diesel Fuel
Nozzle: LNN 0.60 SS

Engine Speed: 1250 rpm

Test Date: 2/2/95
Project Leader: Martin Heimrich
Project No. 08-5744

Engine: Caterpillar 3116
Model Year: 1993

Target Catalyst Inlet Temp., deg C	Actual Catalyst Inlet Temp., deg C	Exhaust Fuel Spray	Engine Torque, lb-ft	Exhaust Manifold, Temp., deg C	Catalyst Bed Temp., deg C	NOx Dilute, ppm	HC Dilute, ppmC	NOx Reduction (WRT No Fuel Test), %
180	181	No Fuel	100	230	185	50	10	-4.00
	182	Fuel	100	230	186	52.0	582	
190	191	No Fuel	115	238	197	53.8	19.5	-2.23
	191	Fuel	115	238	197	55.0	668.5	
200	201	No Fuel	125	250	208	58.8	19.5	-2.04
	201	Fuel	125	250	208	60.0	717	
210	210	No Fuel	135	263	218	63.8	17	-1.10
	210	Fuel	135	263	218	64.5	695	
220	220	No Fuel	150	278	228	70.0	15.5	-0.71
	221	Fuel	150	278	229	70.5	636	
230	230	No Fuel	160	285	238	72.2	14.5	-0.42
	230	Fuel	160	285	236	72.5	710.5	
240	241	No Fuel	182	308	250	81.5	12	4.29
	241	Fuel	182	308	252	78.0	683.5	

APPENDIX G

STEADY-STATE EMISSION TEST SHEETS
FOR
CATALYST GROUP "B"

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-58-SS200F RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/17/95 TIME 12:26	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 749.0 MM HG (29.49 IN HG)	CVS: 72.0°F RH 32.0 PCT AH 37.4 GR/LB	ENGINE DEW PT. 9.6°C (49.2°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 7.5 G/KG (52.8 GR/LB)	NOX HUMIDITY C.F. .945
		DRY-TO-WET C.F. .988

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.20 (1560.6)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	221.1 (7806.)
	~102
HC SAMPLE METER/RANGE/PPM	****/ 14/ 512.21
HC BCKGRD METER/RANGE/PPM	6.5/ 12/ 6.50
CO SAMPLE METER/RANGE/PPM	4.6/ 12/ 4.37
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	53.9/ 11/ .4146
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	2.6/ 13/ 54.49
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	29.19
HC CONCENTRATION PPM	505.93
CO CONCENTRATION PPM	4.29
CO2 CONCENTRATION PCT	.3763
NOX CONCENTRATION PPM	53.34
HC MASS GRAMS	64.245
CO MASS GRAMS	1.103
CO2 MASS GRAMS	1521.71
NOX MASS GRAMS	21.317
FUEL KG (LB)	.543 (1.20)
KW HR (HP HR)	1.84 (2.47)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	34.880(26.010)	(26.01) (CONT)
BSCO G/KW HR (G/HP HR)	.599(.447)	(.45)
BSNOX G/KW HR (G/HP HR)	11.574(8.630)	(8.63) (CONT)
BSFC KG/KW HR (LB/HP HR)	.295(.485)	
WORK KW HR (HP HR)	1.84(2.47)	
BSCO2 G/KW HR (G/HP HR)	826. (616.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST DG2-58-SS220F RUN
DATE 2/17/95 TIME 12:47
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 749.0 MM HG (29.49 IN HG)
ENGINE AIR TEMP. 23.9°C (75.0°F)

CVS: 72.0°F RH 32.0 PCT AH 37.4 GR/LB
ENGINE ABS. HUM. 7.6 G/KG (53.4 GR/LB)

ENGINE DEW PT. 9.7°C (49.5°F)
NOX HUMIDITY C.F. .947
DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.12 (1558.0)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.7 (7793.)
HC SAMPLE METER/RANGE/PPM	70.0/ 14/ 350.12
HC BCKGRD METER/RANGE/PPM	6.5/ 12/ 6.50
CO SAMPLE METER/RANGE/PPM	9.2/ 12/ 8.78
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	62.4/ 11/ .5028
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	2.5/ 13/ 53.11
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	25.27
HC CONCENTRATION PPM	343.88
CO CONCENTRATION PPM	8.52
CO2 CONCENTRATION PCT	.4641
NOX CONCENTRATION PPM	51.94
HC MASS GRAMS	43.594
CO MASS GRAMS	2.189
CO2 MASS GRAMS	1873.80
NOX MASS GRAMS	20.753
FUEL KG (LB)	.633 (1.40)
KW HR (HP HR)	2.24 (3.00)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	19.487(14.531) (14.53) (CONT)
BSCO G/KW HR (G/HP HR)	.979(.730) (.73)
BSNOX G/KW HR (G/HP HR)	9.277(6.918) (6.92) (CONT)
BSFC KG/KW HR (LB/HP HR)	.283(.465)
WORK KW HR (HP HR)	2.24(3.00)
BSCO2 G/KW HR (G/HP HR)	838. (625.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-58-SS240F RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/17/95 TIME 1:10	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 749.0 MM HG (29.49 IN HG)	CVS: 73.0°F RH 36.0 PCT AH 43.9 GR/LB	ENGINE DEW PT. 9.6°C (49.3°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 7.6 G/KG (53.0 GR/LB)	NOX HUMIDITY C.F. .946
		DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.13 (1558.2)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.7 (7794.)
HC SAMPLE METER/RANGE/PPM	17.5/ 14/ 87.41
HC BCKGRD METER/RANGE/PPM	6.5/ 12/ 6.50
CO SAMPLE METER/RANGE/PPM	8.3/ 12/ 7.92
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	70.6/ 11/ .5949
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	3.0/ 13/ 61.72
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	22.52
HC CONCENTRATION PPM	81.20
CO CONCENTRATION PPM	7.65
CO2 CONCENTRATION PCT	.5558
NOX CONCENTRATION PPM	60.20
HC MASS GRAMS	10.295
CO MASS GRAMS	1.965
CO2 MASS GRAMS	2244.42
NOX MASS GRAMS	24.033
FUEL KG (LB)	.716 (1.58)
KW HR (HP HR)	2.62 (3.52)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	3.922(2.925) (2.92) (CONT)
BSCO G/KW HR (G/HP HR)	.748(.558) (.56)
BSNOX G/KW HR (G/HP HR)	9.156(6.828) (6.83) (CONT)
BSFC KG/KW HR (LB/HP HR)	.273(.449)
WORK KW HR (HP HR)	2.62(3.52)
BSCO2 G/KW HR (G/HP HR)	855. (638.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-60-SS200 F RUN
DATE 2/20/95 TIME 3:00
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 745.2 MM HG (29.34 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 79.0°F RH 23.0 PCT AH 34.4 GR/LB
ENGINE ABS. HUM. 7.3 G/KG (50.9 GR/LB)

ENGINE DEW PT. 8.9°C (48.1°F)
NOX HUMIDITY C.F. .941
DRY-TO-WET C.F. .988

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	43.88 (1549.3)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	219.4 (7746.)
HC SAMPLE METER/RANGE/PPM	97.6/ 14/ 488.36
HC BCKGRD METER/RANGE/PPM	7.4/ 2/ 7.40
CO SAMPLE METER/RANGE/PPM	10.3/ 12/ 9.85
CO BCKGRD METER/RANGE/PPM	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	56.1/ 11/ .4367
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	2.5/ 13/ 52.63
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	27.98
HC CONCENTRATION PPM	481.23
CO CONCENTRATION PPM	9.24
CO2 CONCENTRATION PCT	.3985
NOX CONCENTRATION PPM	51.72
HC MASS GRAMS	60.644
CO MASS GRAMS	2.360
CO2 MASS GRAMS	1599.33
NOX MASS GRAMS	20.418
FUEL KG (LB)	.564 (1.24)
KW HR (HP HR)	2.02 (2.71)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	30.009(22.378)	(22.38)	(CONT)
BSCO G/KW HR (G/HP HR)	1.168(.871)	(.87)	
BSNOX G/KW HR (G/HP HR)	10.104(7.534)	(7.53)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.279(.459)		
WORK KW HR (HP HR)	2.02(2.71)		
BSCO2 G/KW HR (G/HP HR)	791. (590.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-60-SS220 F RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/20/95 TIME 3:25	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 745.0 MM HG (29.33 IN HG)	CVS: 79.0°F RH 20.0 PCT AH 30.3 GR/LB	ENGINE DEW PT. 8.9°C (48.1°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 7.3 G/KG (50.9 GR/LB)	NOX HUMIDITY C.F. .941
		DRY-TO-WET C.F. .989

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.87 (1549.0)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	219.4 (7748.)
HC SAMPLE METER/RANGE/PPM	66.8/ 14/ 334.51
HC BCKGRD METER/RANGE/PPM	7.6/ 2/ 7.60
CO SAMPLE METER/RANGE/PPM	13.6/ 12/ 13.05
CO BCKGRD METER/RANGE/PPM	.7/ 12/ .66
CO2 SAMPLE METER/RANGE/PCT	62.5/ 11/ .5039
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	2.6/ 13/ 53.36
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	25.27
HC CONCENTRATION PPM	327.21
CO CONCENTRATION PPM	12.21
CO2 CONCENTRATION PCT	.4658
NOX CONCENTRATION PPM	52.46
HC MASS GRAMS	41.241
CO MASS GRAMS	3.118
CO2 MASS GRAMS	1869.65
NOX MASS GRAMS	20.715
FUEL KG (LB)	.630 (1.39)
KW HR (HP HR)	2.33 (3.12)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	17.726(13.218)	(13.22) (CONT)
BSCO G/KW HR (G/HP HR)	1.340(.999)	(1.00)
BSNOX G/KW HR (G/HP HR)	8.904(6.639)	(6.64) (CONT)
BSFC KG/KW HR (LB/HP HR)	.271(.445)	
WORK KW HR (HP HR)	2.33(3.12)	
BSCO2 G/KW HR (G/HP HR)	804. (599.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-60-SS240 F RUN
DATE 2/20/95 TIME 3:40
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 745.0 MM HG (29.33 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 80.0°F RH 21.0 PCT AH 32.8 GR/LB
ENGINE ABS. HUM. 7.3 G/KG (51.3 GR/LB)

ENGINE DEW PT. 9.1°C (48.3°F)
NOX HUMIDITY C.F. .942
DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.87 (1549.2)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	219.4 (7749.)
HC SAMPLE METER/RANGE/PPM	23.9/ 14/ 119.59
HC BCKGRD METER/RANGE/PPM	6.1/ 2/ 6.10
CO SAMPLE METER/RANGE/PPM	11.8/ 12/ 11.30
CO BCKGRD METER/RANGE/PPM	1.2/ 12/ 1.13
CO2 SAMPLE METER/RANGE/PCT	71.3/ 11/ .6031
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	3.2/ 13/ 65.70
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	22.09
HC CONCENTRATION PPM	113.76
CO CONCENTRATION PPM	10.02
CO2 CONCENTRATION PCT	.5647
NOX CONCENTRATION PPM	64.57
HC MASS GRAMS	14.340
CO MASS GRAMS	2.559
CO2 MASS GRAMS	2266.86
NOX MASS GRAMS	25.522
FUEL KG (LB)	.728 (1.60)
KW HR (HP HR)	2.77 (3.72)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	5.170(3.855) (3.85) (CONT)
BSCO G/KW HR (G/HP HR)	.923(.688) (.69)
BSNOX G/KW HR (G/HP HR)	9.200(6.861) (6.86) (CONT)
BSFC KG/KW HR (LB/HP HR)	.262(.431)
WORK KW HR (HP HR)	2.77(3.72)
BSCO2 G/KW HR (G/HP HR)	817. (609.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-61-SS200 FT RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 2/21/95 TIME 2:35	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 745.2 MM HG (29.34 IN HG)	CVS: 80.0°F RH 21.0 PCT AH 32.7 GR/LB	ENGINE DEW PT. 10.8°C (51.4°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 8.2 G/KG (57.6 GR/LB)	NOX HUMIDITY C.F. .957
		DRY-TO-WET C.F. .989

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.00 (1553.8)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.1 (7771.)
HC SAMPLE METER/RANGE/PPM	****/ 14/ 604.67
HC BCKGRD METER/RANGE/PPM	7.8/ 2/ 7.80
CO SAMPLE METER/RANGE/PPM	6.2/ 12/ 5.90
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	85.0/ 12/ .4137
CO2 BCKGRD METER/RANGE/PCT	11.0/ 12/ .0413
NOX SAMPLE METER/RANGE/PPM (D)	2.6/ 13/ 54.53
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	28.67
HC CONCENTRATION PPM	597.14
CO CONCENTRATION PPM	5.72
CO2 CONCENTRATION PCT	.3739
NOX CONCENTRATION PPM	53.44
HC MASS GRAMS	75.494
CO MASS GRAMS	1.466
CO2 MASS GRAMS	1505.47
NOX MASS GRAMS	21.519
FUEL KG (LB)	.549 (1.21)
KW HR (HP HR)	1.86 (2.49)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	40.658(30.319) (30.32) (CONT)
BSCO G/KW HR (G/HP HR)	.789(.589) (.59)
BSNOX G/KW HR (G/HP HR)	11.589(8.642) (8.64) (CONT)
BSFC KG/KW HR (LB/HP HR)	.296(.486)
WORK KW HR (HP HR)	1.86(2.49)
BSCO2 G/KW HR (G/HP HR)	811. (605.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-61-SS220FT RUN
DATE 2/21/95 TIME 2:48
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 745.2 MM HG (29.34 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 80.0°F RH 21.0 PCT AH 32.7 GR/LB
ENGINE ABS. HUM. 8.1 G/KG (56.8 GR/LB)

ENGINE DEW PT. 10.6°C (51.0°F)
NOX HUMIDITY C.F. .955
DRY-TO-WET C.F. .988

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	43.87 (1549.1)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	219.4 (7746.)
HC SAMPLE METER/RANGE/PPM	81.3/ 14/ 406.69
HC BCKGRD METER/RANGE/PPM	10.0/ 2/ 10.00
CO SAMPLE METER/RANGE/PPM	12.2/ 12/ 11.69
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	63.5/ 11/ .5147
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	2.7/ 13/ 55.35
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	24.46
HC CONCENTRATION PPM	397.10
CO CONCENTRATION PPM	11.40
CO2 CONCENTRATION PCT	.4755
NOX CONCENTRATION PPM	54.30
HC MASS GRAMS	50.037
CO MASS GRAMS	2.912
CO2 MASS GRAMS	1908.28
NOX MASS GRAMS	21.746
FUEL KG (LB)	.651 (1.44)
KW HR (HP HR)	2.27 (3.05)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	22.000(16.406) (16.41) (CONT)
BSCO	G/KW HR (G/HP HR)	1.280(.955) (.95)
BSNOX	G/KW HR (G/HP HR)	9.561(7.130) (7.13) (CONT)
BSFC	KG/KW HR (LB/HP HR)	.286(.471)
WORK	KW HR (HP HR)	2.27(3.05)
BSCO2	G/KW HR (G/HP HR)	839. (626.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-61-SS240 FT RUN
DATE 2/21/95 TIME 3:10
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 745.2 MM HG (29.34 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 81.0°F RH 22.0 PCT AH 35.3 GR/LB
ENGINE ABS. HUM. 8.2 G/KG (57.4 GR/LB)

ENGINE DEW PT. 10.7°C (51.3°F)
NOX HUMIDITY C.F. .956
DRY-TO-WET C.F. .986

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	306.1
TOT. BLOWER RATE SCMM (SCFM)	42.83 (1512.4)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.5 (7716.)
HC SAMPLE METER/RANGE/PPM	17.9/ 14/ 89.46
HC BCKGRD METER/RANGE/PPM	6.4/ 2/ 6.40
CO SAMPLE METER/RANGE/PPM	10.0/ 12/ 9.56
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	71.5/ 11/ .6055
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	3.1/ 13/ 65.78
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	22.12
HC CONCENTRATION PPM	83.35
CO CONCENTRATION PPM	9.29
CO2 CONCENTRATION PCT	.5670
NOX CONCENTRATION PPM	64.51
HC MASS GRAMS	10.462
CO MASS GRAMS	2.363
CO2 MASS GRAMS	2266.59
NOX MASS GRAMS	25.778
FUEL KG (LB)	.724 (1.60)
KW HR (HP HR)	2.60 (3.49)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	4.020(2.998) (3.00)	(CONT)
BSCO G/KW HR (G/HP HR)	.908(.677) (.68)	
BSNOX G/KW HR (G/HP HR)	9.905(7.386) (7.39)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.278(.457)	
WORK KW HR (HP HR)	2.60(3.49)	
BSCO2 G/KW HR (G/HP HR)	871. (649.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-65-SS-200 E RUN
DATE 4/ 5/95 TIME 11:21
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.6 MM HG (29.04 IN HG)
ENGINE AIR TEMP. 23.3°C (74.0°F)

CVS: 71.0°F RH 65.0 PCT AH 75.6 GR/LB
ENGINE ABS. HUM. 8.6 G/KG (60.2 GR/LB)

ENGINE DEW PT. 11.3°C (52.3°F)
NOX HUMIDITY C.F. .963
DRY-TO-WET C.F. .979

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.61 (1539.8)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.1 (7702.)
HC SAMPLE METER/RANGE/PPM	9.2/ 13/ 192.54
HC BCKGRD METER/RANGE/PPM	3.5/ 2/ 3.50
CO SAMPLE METER/RANGE/PPM	4.0/ 12/ 3.79
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	57.0/ 11/ .4459
CO2 BCKGRD METER/RANGE/PCT	7.3/ 11/ .0427
NOX SAMPLE METER/RANGE/PPM (D)	2.7/ 13/ 56.16
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .20
DILUTION FACTOR	29.24
HC CONCENTRATION PPM	189.16
CO CONCENTRATION PPM	3.50
CO2 CONCENTRATION PCT	.4047
NOX CONCENTRATION PPM	54.78
HC MASS GRAMS	23.700
CO MASS GRAMS	.890
CO2 MASS GRAMS	1614.78
NOX MASS GRAMS	22.003
FUEL KG (LB)	.531 (1.17)
KW HR (HP HR)	1.89 (2.53)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	12.562(9.368) (9.37)	(CONT)
BSCO G/KW HR (G/HP HR)	.472(.352) (.35)	
BSNOX G/KW HR (G/HP HR)	11.663(8.697) (8.70)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.282(.463)	
WORK KW HR (HP HR)	1.89(2.53)	
BSCO2 G/KW HR (G/HP HR)	856. (638.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST PS1-65-SS-220E RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 5/95 TIME 11:43	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 737.6 MM HG (29.04 IN HG)	CVS: 71.0°F RH 60.0 PCT AH 70.8 GR/LB	ENGINE DEW PT. 10.9°C (51.6°F)
ENGINE AIR TEMP. 23.3°C (74.0°F)	ENGINE ABS. HUM. 8.4 G/KG (58.7 GR/LB)	NOX HUMIDITY C.F. .959
		DRY-TO-WET C.F. .979

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.72 (1543.7)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.7 (7721.)
HC SAMPLE METER/RANGE/PPM	5.7/ 13/ 118.91
HC BCKGRD METER/RANGE/PPM	3.5/ 2/ 3.50
CO SAMPLE METER/RANGE/PPM	3.1/ 12/ 2.94
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	61.9/ 11/ .4974
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	3.3/ 13/ 68.71
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	26.71
HC CONCENTRATION PPM	115.54
CO CONCENTRATION PPM	2.85
CO2 CONCENTRATION PCT	.4586
NOX CONCENTRATION PPM	66.72
HC MASS GRAMS	14.513
CO MASS GRAMS	.726
CO2 MASS GRAMS	1834.68
NOX MASS GRAMS	26.763
FUEL KG (LB)	.591 (1.30)
KW HR (HP HR)	2.28 (3.06)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	6.360(	4.743) (4.74)	(CONT)
BSCO	G/KW HR (G/HP HR)	.318(	.237) (.24)	
BSNOX	G/KW HR (G/HP HR)	11.729(	8.746) (8.75)	(CONT)
BSFC	KG/KW HR (LB/HP HR)	.259(	.426)	
WORK	KW HR (HP HR)	2.28(	3.06)	
BSCO2	G/KW HR (G/HP HR)	804. (	600.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST PS1-65-SS-240E RUN
DATE 4/ 5/95 TIME 12:03
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.4 MM HG (29.03 IN HG)
ENGINE AIR TEMP. 23.9°C (75.0°F)

CVS: 72.0°F RH 57.0 PCT AH 69.1 GR/LB
ENGINE ABS. HUM. 8.3 G/KG (58.2 GR/LB)

ENGINE DEW PT. 10.8°C (51.4°F)
NOX HUMIDITY C.F. .958
DRY-TO-WET C.F. .979

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.70 (1543.1)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.6 (7718.)
HC SAMPLE METER/RANGE/PPM	.8/ 13/ 16.51
HC BCKGRD METER/RANGE/PPM	3.5/ 2/ 3.50
CO SAMPLE METER/RANGE/PPM	1.1/ 12/ 1.04
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	67.0/ 11/ .5536
CO2 BCKGRD METER/RANGE/PCT	6.7/ 11/ .0391
NOX SAMPLE METER/RANGE/PPM (D)	4.0/ 13/ 83.70
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	24.51
HC CONCENTRATION PPM	13.15
CO CONCENTRATION PPM	.83
CO2 CONCENTRATION PCT	.5161
NOX CONCENTRATION PPM	81.30
HC MASS GRAMS	1.651
CO MASS GRAMS	.212
CO2 MASS GRAMS	2063.82
NOX MASS GRAMS	32.565
FUEL KG (LB)	.650 (1.43)
KW HR (HP HR)	2.86 (3.83)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.578(	.431) (	.43)	(CONT)
BSCO G/KW HR (G/HP HR)	.074(	.055) (	.06)	
BSNOX G/KW HR (G/HP HR)	11.402(	8.503) (	8.50)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.228(	.374)		
WORK KW HR (HP HR)	2.86(	3.83)		
BSCO2 G/KW HR (G/HP HR)	723. (	539.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-67-200FE RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 6/95 TIME 3:09	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 737.1 MM HG (29.02 IN HG)	CVS: 77.0°F RH 43.0 PCT AH 60.8 GR/LB	ENGINE DEW PT. 10.8°C (51.5°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 8.4 G/KG (58.5 GR/LB)	NOX HUMIDITY C.F. .959
		DRY-TO-WET C.F. .982

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.2
TOT. BLOWER RATE SCMM (SCFM)	43.54 (1537.5)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	217.9 (7693.)
HC SAMPLE METER/RANGE/PPM	9.1/ 14/ 45.49
HC BCKGRD METER/RANGE/PPM	5.3/ 2/ 5.30
CO SAMPLE METER/RANGE/PPM	5.7/ 12/ 5.42
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	56.5/ 11/ .4408
CO2 BCKGRD METER/RANGE/PCT	6.7/ 11/ .0391
NOX SAMPLE METER/RANGE/PPM (D)	2.3/ 13/ 48.09
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	30.53
HC CONCENTRATION PPM	40.36
CO CONCENTRATION PPM	5.30
CO2 CONCENTRATION PCT	.4030
NOX CONCENTRATION PPM	46.94
HC MASS GRAMS	5.051
CO MASS GRAMS	1.344
CO2 MASS GRAMS	1606.37
NOX MASS GRAMS	18.753
FUEL KG (LB)	.510 (1.13)
KW HR (HP HR)	1.99 (2.67)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	2.537(1.892) (1.89) (CONT)
BSCO G/KW HR (G/HP HR)	.675(.503) (.50)
BSNOX G/KW HR (G/HP HR)	9.419(7.024) (7.02) (CONT)
BSFC KG/KW HR (LB/HP HR)	.256(.421)
WORK KW HR (HP HR)	1.99(2.67)
BSCO2 G/KW HR (G/HP HR)	807. (602.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST DG2-67-220FE RUN
DATE 4/ 6/95 TIME 3:29
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 736.9 MM HG (29.01 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 77.0°F RH 43.0 PCT AH 60.8 GR/LB
ENGINE ABS. HUM. 8.4 G/KG (58.7 GR/LB)

ENGINE DEW PT. 10.9°C (51.6°F)
NOX HUMIDITY C.F. .959
DRY-TO-WET C.F. .981

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.53 (1536.9)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	217.7 (7687.)
HC SAMPLE METER/RANGE/PPM	2.3/ 14/ 11.42
HC BCKGRD METER/RANGE/PPM	10.7/ 2/ 10.70
CO SAMPLE METER/RANGE/PPM	6.7/ 12/ 6.38
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	66.7/ 11/ .5502
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	2.8/ 13/ 57.87
NOX BCKGRD METER/RANGE/PPM	1.4/ 2/ 1.40
DILUTION FACTOR	24.66
HC CONCENTRATION PPM	1.16
CO CONCENTRATION PPM	6.13
CO2 CONCENTRATION PCT	.5110
NOX CONCENTRATION PPM	55.44
HC MASS GRAMS	.144
CO MASS GRAMS	1.554
CO2 MASS GRAMS	2034.98
NOX MASS GRAMS	22.144
FUEL KG (LB)	.640 (1.41)
KW HR (HP HR)	2.48 (3.32)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.058(	.044) (	.04)	(CONT)
BSCO G/KW HR (G/HP HR)	.628(	.468) (	.47)	
BSNOX G/KW HR (G/HP HR)	8.944(	6.670) (	6.67)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.259(	.425)		
WORK KW HR (HP HR)	2.48(	3.32)		
BSCO2 G/KW HR (G/HP HR)	822. (	613.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-67-240FE RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 6/95 TIME 3:44	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 736.9 MM HG (29.01 IN HG)	CVS: 78.0°F RH 43.0 PCT AH 63.9 GR/LB	ENGINE DEW PT. 10.9°C (51.7°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 8.4 G/KG (58.9 GR/LB)	NOX HUMIDITY C.F. .960
		DRY-TO-WET C.F. .981

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.66 (1541.6)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.4 (7711.)
HC SAMPLE METER/RANGE/PPM	1.0/ 14/ 4.75
HC BCKGRD METER/RANGE/PPM	8.7/ 2/ 8.70
CO SAMPLE METER/RANGE/PPM	3.7/ 12/ 3.51
CO BCKGRD METER/RANGE/PPM	.6/ 12/ .57
CO2 SAMPLE METER/RANGE/PCT	66.2/ 11/ .5446
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	3.5/ 13/ 72.63
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	24.96
HC CONCENTRATION PPM	-3.60
CO CONCENTRATION PPM	2.89
CO2 CONCENTRATION PCT	.5065
NOX CONCENTRATION PPM	70.74
HC MASS GRAMS	.000
CO MASS GRAMS	.734
CO2 MASS GRAMS	2023.43
NOX MASS GRAMS	28.357
FUEL KG (LB)	.636 (1.40)
KW HR (HP HR)	2.75 (3.69)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(	.000)	(.00)	(CONT)
BSCO G/KW HR (G/HP HR)	.267(	.199)	(.20)	
BSNOX G/KW HR (G/HP HR)	10.306(	7.685)	(7.68)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.231(	.380)		
WORK KW HR (HP HR)	2.75(	3.69)		
BSCO2 G/KW HR (G/HP HR)	735. (	548.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST DG2-68-200E RUN
DATE 4/ 7/95 TIME 2:30
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.4 MM HG (29.03 IN HG)
ENGINE AIR TEMP. 23.9°C (75.0°F)

CVS: 74.0°F RH 54.0 PCT AH 70.6 GR/LB
ENGINE ABS. HUM. 8.7 G/KG (60.7 GR/LB)

ENGINE DEW PT. 11.4°C (52.5°F)
NOX HUMIDITY C.F. .964
DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.57 (1538.4)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	217.9 (7695.)
HC SAMPLE METER/RANGE/PPM	5.8/ 13/ 120.08
HC BCKGRD METER/RANGE/PPM	84.2/ 1/ 8.46
CO SAMPLE METER/RANGE/PPM	4.8/ 12/ 4.56
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	57.3/ 11/ .4490
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0385
NOX SAMPLE METER/RANGE/PPM (D)	2.5/ 13/ 51.52
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	29.50
HC CONCENTRATION PPM	111.91
CO CONCENTRATION PPM	4.35
CO2 CONCENTRATION PCT	.4119
NOX CONCENTRATION PPM	50.20
HC MASS GRAMS	14.009
CO MASS GRAMS	1.103
CO2 MASS GRAMS	1641.97
NOX MASS GRAMS	20.168
FUEL KG (LB)	.530 (1.17)
KW HR (HP HR)	1.98 (2.65)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	7.089(5.286) (5.29)	(CONT)
BSCO G/KW HR (G/HP HR)	.558(.416) (.42)	
BSNOX G/KW HR (G/HP HR)	10.206(7.611) (7.61)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.268(.441)	
WORK KW HR (HP HR)	1.98(2.65)	
BSCO2 G/KW HR (G/HP HR)	831. (620.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST DG2-68-220E RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/ 7/95 TIME 2:45	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 737.4 MM HG (29.03 IN HG)	CVS: 74.0°F RH 54.0 PCT AH 70.6 GR/LB	ENGINE DEW PT. 11.4°C (52.5°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 8.7 G/KG (60.7 GR/LB)	NOX HUMIDITY C.F. .964
		DRY-TO-WET C.F. .980

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	43.64 (1540.9)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.2 (7704.)
HC SAMPLE METER/RANGE/PPM	1.7/ 13/ 35.15
HC BCKGRD METER/RANGE/PPM	57.2/ 1/ 5.74
CO SAMPLE METER/RANGE/PPM	2.1/ 12/ 1.99
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	61.1/ 11/ .4888
CO2 BCKGRD METER/RANGE/PCT	7.1/ 11/ .0415
NOX SAMPLE METER/RANGE/PPM (D)	3.2/ 13/ 66.36
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	27.64
HC CONCENTRATION PPM	29.61
CO CONCENTRATION PPM	1.75
CO2 CONCENTRATION PCT	.4488
NOX CONCENTRATION PPM	64.43
HC MASS GRAMS	3.712
CO MASS GRAMS	.446
CO2 MASS GRAMS	1791.65
NOX MASS GRAMS	25.919
FUEL KG (LB)	.567 (1.25)
KW HR (HP HR)	2.30 (3.09)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.611	(1.201)	(1.20)	(CONT)
BSCO G/KW HR (G/HP HR)	.193	(.144)	(.14)	
BSNOX G/KW HR (G/HP HR)	11.248	(8.388)	(8.39)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.246	(.404)		
WORK KW HR (HP HR)	2.30	(3.09)		
BSCO2 G/KW HR (G/HP HR)	778.	(580.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST DG2-68-240E RUN
DATE 4/ 7/95 TIME 3:02
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 737.4 MM HG (29.03 IN HG)
ENGINE AIR TEMP. 23.9°C (75.0°F)

CVS: 74.0°F RH 54.0 PCT AH 70.6 GR/LB
ENGINE ABS. HUM. 8.8 G/KG (61.6 GR/LB)

ENGINE DEW PT. 11.6°C (52.9°F)
NOX HUMIDITY C.F. .966
DRY-TO-WET C.F. .979

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.62 (1540.2)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.2 (7703.)
HC SAMPLE METER/RANGE/PPM	.7/ 13/ 14.13
HC BCKGRD METER/RANGE/PPM	47.9/ 1/ 4.81
CO SAMPLE METER/RANGE/PPM	1.1/ 12/ 1.04
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	66.1/ 11/ .5435
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	3.8/ 13/ 79.03
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .20
DILUTION FACTOR	24.98
HC CONCENTRATION PPM	9.51
CO CONCENTRATION PPM	.92
CO2 CONCENTRATION PCT	.5048
NOX CONCENTRATION PPM	77.18
HC MASS GRAMS	1.192
CO MASS GRAMS	.234
CO2 MASS GRAMS	2014.70
NOX MASS GRAMS	31.119
FUEL KG (LB)	.634 (1.40)
KW HR (HP HR)	2.79 (3.74)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.427(	.319) (	.32)	(CONT)
BSCO G/KW HR (G/HP HR)	.084(	.063) (	.06)	
BSNOX G/KW HR (G/HP HR)	11.158(	8.320) (	8.32)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.227(	.374)		
WORK KW HR (HP HR)	2.79(	3.74)		
BSCO2 G/KW HR (G/HP HR)	722. (	539.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST UNC-72-200 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/11/95 TIME 2:48	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 740.2 MM HG (29.14 IN HG)	CVS: 74.0°F RH 21.0 PCT AH 26.9 GR/LB	ENGINE DEW PT. 13.8°C (56.8°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 10.1 G/KG (70.9 GR/LB)	NOX HUMIDITY C.F. .989
		DRY-TO-WET C.F. .990

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.05 (1555.3)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.3 (7779.)
HC SAMPLE METER/RANGE/PPM	1.3/ 13/ 26.52
HC BCKGRD METER/RANGE/PPM	5.4/ 2/ 5.40
CO SAMPLE METER/RANGE/PPM	9.1/ 12/ 8.69
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	55.5/ 11/ .4307
CO2 BCKGRD METER/RANGE/PCT	6.7/ 11/ .0391
NOX SAMPLE METER/RANGE/PPM (D)	2.9/ 13/ 59.45
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .20
DILUTION FACTOR	31.35
HC CONCENTRATION PPM	21.29
CO CONCENTRATION PPM	8.28
CO2 CONCENTRATION PCT	.3928
NOX CONCENTRATION PPM	58.66
HC MASS GRAMS	2.694
CO MASS GRAMS	2.125
CO2 MASS GRAMS	1583.32
NOX MASS GRAMS	24.454
FUEL KG (LB)	.501 (1.10)
KW HR (HP HR)	2.01 (2.69)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.343(	1.002)	(1.00)	(CONT)
BSCO G/KW HR (G/HP HR)	1.059(	.790)	(.79)	
BSNOX G/KW HR (G/HP HR)	12.191(	9.091)	(9.09)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.250(	.411)		
WORK KW HR (HP HR)	2.01(	2.69)		
BSCO2 G/KW HR (G/HP HR)	789. (	589.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST UNC-72-220 RUN
DATE 4/11/95 TIME 3:10
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 739.9 MM HG (29.13 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 74.0°F RH 21.0 PCT AH 27.0 GR/LB
ENGINE ABS. HUM. 9.9 G/KG (69.4 GR/LB)

ENGINE DEW PT. 13.4°C (56.2°F)
NOX HUMIDITY C.F. .986
DRY-TO-WET C.F. .990

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.05 (1555.4)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.3 (7779.)
HC SAMPLE METER/RANGE/PPM	1.5/ 13/ 31.26
HC BCKGRD METER/RANGE/PPM	4.8/ 2/ 4.80
CO SAMPLE METER/RANGE/PPM	9.5/ 12/ 9.07
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	59.5/ 11/ .4719
CO2 BCKGRD METER/RANGE/PCT	6.8/ 11/ .0397
NOX SAMPLE METER/RANGE/PPM (D)	3.3/ 13/ 68.30
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .20
DILUTION FACTOR	28.60
HC CONCENTRATION PPM	26.63
CO CONCENTRATION PPM	8.75
CO2 CONCENTRATION PCT	.4336
NOX CONCENTRATION PPM	67.40
HC MASS GRAMS	3.370
CO MASS GRAMS	2.244
CO2 MASS GRAMS	1747.74
NOX MASS GRAMS	27.987
FUEL KG (LB)	.554 (1.22)
KW HR (HP HR)	2.35 (3.15)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	1.435(	1.070) (1.07)	(CONT)
BSCO	G/KW HR (G/HP HR)	.955(	.712) (.71)	
BSNOX	G/KW HR (G/HP HR)	11.915(	8.885) (8.88)	(CONT)
BSFC	KG/KW HR (LB/HP HR)	.236(	.387)	
WORK	KW HR (HP HR)	2.35(	3.15)	
BSCO2	G/KW HR (G/HP HR)	744. (	555.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST UNC-72-240 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/11/95 TIME 3:38	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 739.6 MM HG (29.12 IN HG)	CVS: 74.0°F RH 21.0 PCT AH 27.0 GR/LB	ENGINE DEW PT. 14.0°C (57.2°F)
ENGINE AIR TEMP. 25.0°C (77.0°F)	ENGINE ABS. HUM. 10.3 G/KG (72.0 GR/LB)	NOX HUMIDITY C.F. .992
		DRY-TO-WET C.F. .989

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	44.04 (1555.0)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.2 (7775.)
HC SAMPLE METER/RANGE/PPM	1.4/ 13/ 29.40
HC BCKGRD METER/RANGE/PPM	4.8/ 2/ 4.80
CO SAMPLE METER/RANGE/PPM	10.2/ 12/ 9.75
CO BCKGRD METER/RANGE/PPM	.6/ 12/ .57
CO2 SAMPLE METER/RANGE/PCT	65.3/ 11/ .5345
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	3.8/ 13/ 78.47
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	25.28
HC CONCENTRATION PPM	24.79
CO CONCENTRATION PPM	9.04
CO2 CONCENTRATION PCT	.4953
NOX CONCENTRATION PPM	77.32
HC MASS GRAMS	3.135
CO MASS GRAMS	2.318
CO2 MASS GRAMS	1995.03
NOX MASS GRAMS	32.306
FUEL KG (LB)	.631 (1.39)
KW HR (HP HR)	2.82 (3.78)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.112(	.829) (	.83)	(CONT)
BSCO G/KW HR (G/HP HR)	.822(	.613) (	.61)	
BSNOX G/KW HR (G/HP HR)	11.461(	8.547) (	8.55)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.224(	.368)		
WORK KW HR (HP HR)	2.82(	3.78)		
BSCO2 G/KW HR (G/HP HR)	708. (	528.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-74-200 F RUN
DATE 4/13/95 TIME 2:33
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 745.2 MM HG (29.34 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 74.0°F RH 37.0 PCT AH 46.9 GR/LB
ENGINE ABS. HUM. 10.5 G/KG (73.3 GR/LB)

ENGINE DEW PT. 14.4°C (57.9°F)
NOX HUMIDITY C.F. .996
DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.12 (1557.8)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.7 (7792.)
HC SAMPLE METER/RANGE/PPM	2.2/ 13/ 46.02
HC BCKGRD METER/RANGE/PPM	4.9/ 2/ 4.90
CO SAMPLE METER/RANGE/PPM	8.6/ 12/ 8.20
CO BCKGRD METER/RANGE/PPM	.5/ 12/ .47
CO2 SAMPLE METER/RANGE/PCT	64.5/ 11/ .5257
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0439
NOX SAMPLE METER/RANGE/PPM (D)	1.9/ 13/ 40.01
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	25.63
HC CONCENTRATION PPM	41.31
CO CONCENTRATION PPM	7.58
CO2 CONCENTRATION PCT	.4835
NOX CONCENTRATION PPM	39.01
HC MASS GRAMS	5.236
CO MASS GRAMS	1.947
CO2 MASS GRAMS	1951.66
NOX MASS GRAMS	16.389
FUEL KG (LB)	.619 (1.37)
KW HR (HP HR)	2.16 (2.89)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	2.430(1.812)	(1.81)	(CONT)
BSCO	G/KW HR (G/HP HR)	.903(.674)	(.67)	
BSNOX	G/KW HR (G/HP HR)	7.605(5.671)	(5.67)	(CONT)
BSFC	KG/KW HR (LB/HP HR)	.287(.472)		
WORK	KW HR (HP HR)	2.16(2.89)		
BSCO2	G/KW HR (G/HP HR)	906. (675.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-74-220F RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/13/95 TIME 2:59	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 744.7 MM HG (29.32 IN HG)	CVS: 77.0°F RH 33.0 PCT AH 46.3 GR/LB	ENGINE DEW PT. 13.7°C (56.7°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 10.0 G/KG (70.2 GR/LB)	NOX HUMIDITY C.F. .988
		DRY-TO-WET C.F. .984

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.09 (1556.7)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.5 (7786.)
HC SAMPLE METER/RANGE/PPM	.4/ 13/ 9.34
HC BCKGRD METER/RANGE/PPM	4.6/ 2/ 4.60
CO SAMPLE METER/RANGE/PPM	9.7/ 12/ 9.27
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	70.7/ 11/ .5961
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	2.4/ 13/ 49.02
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	22.77
HC CONCENTRATION PPM	4.94
CO CONCENTRATION PPM	8.88
CO2 CONCENTRATION PCT	.5570
NOX CONCENTRATION PPM	47.86
HC MASS GRAMS	.626
CO MASS GRAMS	2.281
CO2 MASS GRAMS	2246.84
NOX MASS GRAMS	19.932
FUEL KG (LB)	.708 (1.56)
KW HR (HP HR)	2.55 (3.42)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.245(	.183) (	.18)	(CONT)
BSCO G/KW HR (G/HP HR)	.894(	.667) (	.67)	
BSNOX G/KW HR (G/HP HR)	7.816(	5.828) (	5.83)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.277(	.456)		
WORK KW HR (HP HR)	2.55(	3.42)		
BSCO2 G/KW HR (G/HP HR)	881. (	657.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-74-240F RUN
DATE 4/13/95 TIME 3:16
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 744.5 MM HG (29.31 IN HG)
ENGINE AIR TEMP. 25.0°C (77.0°F)

CVS: 76.0°F RH 35.0 PCT AH 48.0 GR/LB
ENGINE ABS. HUM. 10.2 G/KG (71.5 GR/LB)

ENGINE DEW PT. 14.0°C (57.2°F)
NOX HUMIDITY C.F. .991
DRY-TO-WET C.F. .983

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	44.09 (1556.7)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.4 (7783.)
HC SAMPLE METER/RANGE/PPM	.2/ 13/ 3.29
HC BCKGRD METER/RANGE/PPM	5.1/ 2/ 5.10
CO SAMPLE METER/RANGE/PPM	8.7/ 12/ 8.30
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	76.2/ 11/ .6622
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0433
NOX SAMPLE METER/RANGE/PPM (D)	3.1/ 13/ 63.77
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ .40
DILUTION FACTOR	20.52
HC CONCENTRATION PPM	-1.56
CO CONCENTRATION PPM	7.84
CO2 CONCENTRATION PCT	.6210
NOX CONCENTRATION PPM	62.31
HC MASS GRAMS	.000
CO MASS GRAMS	2.011
CO2 MASS GRAMS	2504.06
NOX MASS GRAMS	26.032
FUEL KG (LB)	.788 (1.74)
KW HR (HP HR)	2.99 (4.01)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(	.000)	(.00)	(CONT)
BSCO G/KW HR (G/HP HR)	.672(	.501)	(.50)	
BSNOX G/KW HR (G/HP HR)	8.706(	6.492)	(6.49)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.263(	.433)		
WORK KW HR (HP HR)	2.99(	4.01)		
BSCO2 G/KW HR (G/HP HR)	837. (	624.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-75-200 RUN
DATE 4/14/95 TIME 12:45
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 739.1 MM HG (29.10 IN HG)
ENGINE AIR TEMP. 23.9°C (75.0°F)

CVS: 71.0°F RH 49.0 PCT AH 56.9 GR/LB
ENGINE ABS. HUM. 10.8 G/KG (75.6 GR/LB)

ENGINE DEW PT. 14.7°C (58.5°F)
NOX HUMIDITY C.F. 1.001
DRY-TO-WET C.F. .982

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.76 (1545.3)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.9 (7729.)
HC SAMPLE METER/RANGE/PPM	7.8/ 13/ 163.56
HC BCKGRD METER/RANGE/PPM	5.0/ 2/ 5.00
CO SAMPLE METER/RANGE/PPM	7.2/ 12/ 6.86
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	66.6/ 11/ .5491
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0433
NOX SAMPLE METER/RANGE/PPM (D)	2.1/ 13/ 43.35
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	24.05
HC CONCENTRATION PPM	158.77
CO CONCENTRATION PPM	6.68
CO2 CONCENTRATION PCT	.5075
NOX CONCENTRATION PPM	42.00
HC MASS GRAMS	19.963
CO MASS GRAMS	1.702
CO2 MASS GRAMS	2032.41
NOX MASS GRAMS	17.607
FUEL KG (LB)	.659 (1.45)
KW HR (HP HR)	2.19 (2.94)

TOTAL RESULTS

BSHC	G/KW HR (G/HP HR)	9.106(6.790) (6.79) (CONT)
BSCO	G/KW HR (G/HP HR)	.776(.579) (.58)
BSNOX	G/KW HR (G/HP HR)	8.031(5.989) (5.99) (CONT)
BSFC	KG/KW HR (LB/HP HR)	.301(.494)
WORK	KW HR (HP HR)	2.19(2.94)
BSCO2	G/KW HR (G/HP HR)	927. (691.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-75-220 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/14/95 TIME 1:02	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 738.9 MM HG (29.09 IN HG)	CVS: 71.0°F RH 45.0 PCT AH 52.5 GR/LB	ENGINE DEW PT. 14.8°C (58.6°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 10.8 G/KG (75.9 GR/LB)	NOX HUMIDITY C.F. 1.002
		DRY-TO-WET C.F. .982

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	43.76 (1545.1)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.8 (7725.)
HC SAMPLE METER/RANGE/PPM	.9/ 13/ 19.50
HC BCKGRD METER/RANGE/PPM	7.8/ 2/ 7.80
CO SAMPLE METER/RANGE/PPM	7.2/ 12/ 6.86
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	76.0/ 11/ .6597
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	2.6/ 13/ 54.69
NOX BCKGRD METER/RANGE/PPM	1.2/ 2/ 1.20
DILUTION FACTOR	20.55
HC CONCENTRATION PPM	12.08
CO CONCENTRATION PPM	6.58
CO2 CONCENTRATION PCT	.6197
NOX CONCENTRATION PPM	52.57
HC MASS GRAMS	1.518
CO MASS GRAMS	1.677
CO2 MASS GRAMS	2480.20
NOX MASS GRAMS	22.045
FUEL KG (LB)	.782 (1.72)
KW HR (HP HR)	2.62 (3.52)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.578(	.431) (	.43)	(CONT)
BSCO G/KW HR (G/HP HR)	.639(	.476) (	.48)	
BSNOX G/KW HR (G/HP HR)	8.398(	6.263) (	6.26)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.298(	.489)		
WORK KW HR (HP HR)	2.62(	3.52)		
BSCO2 G/KW HR (G/HP HR)	945. (	705.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-75-240 RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/14/95 TIME 1:22	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 738.9 MM HG (29.09 IN HG)	CVS: 71.0°F RH 49.0 PCT AH 56.9 GR/LB	ENGINE DEW PT. 15.1°C (59.1°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 11.0 G/KG (77.3 GR/LB)	NOX HUMIDITY C.F. 1.006
		DRY-TO-WET C.F. .981

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.69 (1542.6)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.5 (7715.)
HC SAMPLE METER/RANGE/PPM	.2/ 13/ 4.15
HC BCKGRD METER/RANGE/PPM	7.6/ 2/ 7.60
CO SAMPLE METER/RANGE/PPM	7.5/ 12/ 7.15
CO BCKGRD METER/RANGE/PPM	.8/ 12/ .76
CO2 SAMPLE METER/RANGE/PCT	78.9/ 11/ .6960
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM (D)	3.2/ 13/ 65.88
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	19.53
HC CONCENTRATION PPM	-3.06
CO CONCENTRATION PPM	6.23
CO2 CONCENTRATION PCT	.6537
NOX CONCENTRATION PPM	63.95
HC MASS GRAMS	.000
CO MASS GRAMS	1.586
CO2 MASS GRAMS	2613.19
NOX MASS GRAMS	26.880
FUEL KG (LB)	.822 (1.81)
KW HR (HP HR)	3.06 (4.10)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.000(	.000)	(.00)	(CONT)
BSCO G/KW HR (G/HP HR)	.519(	.387)	(.39)	
BSNOX G/KW HR (G/HP HR)	8.792(	6.556)	(6.56)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.269(	.442)		
WORK KW HR (HP HR)	3.06(	4.10)		
BSCO2 G/KW HR (G/HP HR)	855. (	637.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-76-200FE RUN
DATE 4/17/95 TIME 3:34
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 731.8 MM HG (28.81 IN HG)
ENGINE AIR TEMP. 27.2°C (81.0°F)

CVS: 77.0°F RH 60.0 PCT AH 86.6 GR/LB
ENGINE ABS. HUM. 11.7 G/KG (82.1 GR/LB)

ENGINE DEW PT. 15.8°C (60.5°F)
NOX HUMIDITY C.F. 1.019
DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.2
TOT. BLOWER RATE SCMM (SCFM)	43.52 (1536.8)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	217.8 (7689.)
HC SAMPLE METER/RANGE/PPM	1.3/ 13/ 27.05
HC BCKGRD METER/RANGE/PPM	5.4/ 2/ 5.40
CO SAMPLE METER/RANGE/PPM	5.7/ 12/ 5.42
CO BCKGRD METER/RANGE/PPM	.2/ 12/ .19
CO2 SAMPLE METER/RANGE/PCT	59.3/ 11/ .4698
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	2.2/ 13/ 45.70
NOX BCKGRD METER/RANGE/PPM	.8/ 2/ .80
DILUTION FACTOR	28.78
HC CONCENTRATION PPM	21.84
CO CONCENTRATION PPM	5.09
CO2 CONCENTRATION PCT	.4303
NOX CONCENTRATION PPM	43.84
HC MASS GRAMS	2.732
CO MASS GRAMS	1.290
CO2 MASS GRAMS	1714.38
NOX MASS GRAMS	18.599
FUEL KG (LB)	.542 (1.19)
KW HR (HP HR)	2.16 (2.89)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.267(	.945) (	.95)	(CONT)
BSCO G/KW HR (G/HP HR)	.598(	.446) (	.45)	
BSNOX G/KW HR (G/HP HR)	8.630(	6.435) (	6.44)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.251(	.413)		
WORK KW HR (HP HR)	2.16(	2.89)		
BSCO2 G/KW HR (G/HP HR)	796. (	593.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-76-220FE RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/17/95 TIME 3:50	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 731.8 MM HG (28.81 IN HG)	CVS: 77.0°F RH 60.0 PCT AH 86.6 GR/LB	ENGINE DEW PT. 15.2°C (59.4°F)
ENGINE AIR TEMP. 27.2°C (81.0°F)	ENGINE ABS. HUM. 11.3 G/KG (78.9 GR/LB)	NOX HUMIDITY C.F. 1.010
		DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.2
TOT. BLOWER RATE SCMM (SCFM)	43.38 (1531.7)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	217.0 (7663.)
HC SAMPLE METER/RANGE/PPM	.4/ 13/ 8.57
HC BCKGRD METER/RANGE/PPM	6.2/ 2/ 6.20
CO SAMPLE METER/RANGE/PPM	2.9/ 12/ 2.75
CO BCKGRD METER/RANGE/PPM	.3/ 12/ .28
CO2 SAMPLE METER/RANGE/PCT	62.6/ 11/ .5050
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	3.0/ 13/ 63.25
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .30
DILUTION FACTOR	26.90
HC CONCENTRATION PPM	2.60
CO CONCENTRATION PPM	2.40
CO2 CONCENTRATION PCT	.4656
NOX CONCENTRATION PPM	61.43
HC MASS GRAMS	.324
CO MASS GRAMS	.606
CO2 MASS GRAMS	1848.60
NOX MASS GRAMS	25.757
FUEL KG (LB)	.581 (1.28)
KW HR (HP HR)	2.53 (3.39)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.128(.096) (.10) (CONT)
BSCO G/KW HR (G/HP HR)	.240(.179) (.18)
BSNOX G/KW HR (G/HP HR)	10.189(7.598) (7.60) (CONT)
BSFC KG/KW HR (LB/HP HR)	.230(.378)
WORK KW HR (HP HR)	2.53(3.39)
BSCO2 G/KW HR (G/HP HR)	731. (545.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-76-240FE RUN
DATE 4/17/95 TIME 4:09
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 731.5 MM HG (28.80 IN HG)
ENGINE AIR TEMP. 27.8°C (82.0°F)

CVS: 77.0°F RH 60.0 PCT AH 86.6 GR/LB
ENGINE ABS. HUM. 10.9 G/KG (76.1 GR/LB)

ENGINE DEW PT. 14.7°C (58.4°F)
NOX HUMIDITY C.F. 1.003
DRY-TO-WET C.F. .975

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	43.36 (1531.2)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	216.8 (7656.)
HC SAMPLE METER/RANGE/PPM	.3/ 13/ 5.76
HC BCKGRD METER/RANGE/PPM	5.3/ 2/ 5.30
CO SAMPLE METER/RANGE/PPM	2.1/ 12/ 1.99
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	68.3/ 11/ .5683
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0403
NOX SAMPLE METER/RANGE/PPM (D)	3.7/ 13/ 77.24
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	23.92
HC CONCENTRATION PPM	.68
CO CONCENTRATION PPM	1.84
CO2 CONCENTRATION PCT	.5297
NOX CONCENTRATION PPM	74.75
HC MASS GRAMS	.085
CO MASS GRAMS	.464
CO2 MASS GRAMS	2101.22
NOX MASS GRAMS	31.083
FUEL KG (LB)	.660 (1.46)
KW HR (HP HR)	2.90 (3.89)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.029(	.022) (	.02)	(CONT)
BSCO G/KW HR (G/HP HR)	.160(	.119) (	.12)	
BSNOX G/KW HR (G/HP HR)	10.715(	7.990) (	7.99)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.228(	.374)		
WORK KW HR (HP HR)	2.90(	3.89)		
BSCO2 G/KW HR (G/HP HR)	724. (	540.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-77-200E RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/19/95 TIME 11:45	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 733.8 MM HG (28.89 IN HG)	CVS: 74.0°F RH 62.0 PCT AH 80.9 GR/LB	ENGINE DEW PT. 16.1°C (60.9°F)
ENGINE AIR TEMP. 23.9°C (75.0°F)	ENGINE ABS. HUM. 11.9 G/KG (83.0 GR/LB)	NOX HUMIDITY C.F. 1.021
		DRY-TO-WET C.F. .977

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.51 (1536.4)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	217.6 (7685.)
HC SAMPLE METER/RANGE/PPM	1.7/ 13/ 34.63
HC BCKGRD METER/RANGE/PPM	5.7/ 2/ 5.70
CO SAMPLE METER/RANGE/PPM	4.8/ 12/ 4.56
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	60.4/ 11/ .4814
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0385
NOX SAMPLE METER/RANGE/PPM (D)	2.5/ 13/ 51.19
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	28.05
HC CONCENTRATION PPM	29.13
CO CONCENTRATION PPM	4.34
CO2 CONCENTRATION PCT	.4443
NOX CONCENTRATION PPM	49.45
HC MASS GRAMS	3.642
CO MASS GRAMS	1.098
CO2 MASS GRAMS	1769.05
NOX MASS GRAMS	21.021
FUEL KG (LB)	.560 (1.23)
KW HR (HP HR)	2.45 (3.28)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	1.489(1.110)	(1.11)	(CONT)
BSCO G/KW HR (G/HP HR)	.449(.335)	(.33)	
BSNOX G/KW HR (G/HP HR)	8.594(6.409)	(6.41)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.229(.376)		
WORK KW HR (HP HR)	2.45(3.28)		
BSCO2 G/KW HR (G/HP HR)	723. (539.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST JM12-77-220E RUN
DATE 4/19/95 TIME 12:07
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 733.8 MM HG (28.89 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 73.0°F RH 65.0 PCT AH 82.6 GR/LB
ENGINE ABS. HUM. 11.6 G/KG (81.0 GR/LB)

ENGINE DEW PT. 15.7°C (60.2°F)
NOX HUMIDITY C.F. 1.016
DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.65 (1541.4)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	218.3 (7710.)
HC SAMPLE METER/RANGE/PPM	1.3/ 13/ 26.09
HC BCKGRD METER/RANGE/PPM	5.1/ 2/ 5.10
CO SAMPLE METER/RANGE/PPM	5.5/ 12/ 5.23
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	66.3/ 11/ .5457
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0385
NOX SAMPLE METER/RANGE/PPM (D)	2.8/ 13/ 58.53
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ .50
DILUTION FACTOR	24.80
HC CONCENTRATION PPM	21.19
CO CONCENTRATION PPM	4.97
CO2 CONCENTRATION PCT	.5088
NOX CONCENTRATION PPM	56.67
HC MASS GRAMS	2.658
CO MASS GRAMS	1.264
CO2 MASS GRAMS	2032.32
NOX MASS GRAMS	24.034
FUEL KG (LB)	.642 (1.41)
KW HR (HP HR)	2.76 (3.70)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.963(	.718) (	.72)	(CONT)
BSCO G/KW HR (G/HP HR)	.458(	.342) (	.34)	
BSNOX G/KW HR (G/HP HR)	8.711(	6.496) (	6.50)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.233(	.382)		
WORK KW HR (HP HR)	2.76(	3.70)		
BSCO2 G/KW HR (G/HP HR)	737. (	549.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST JM12-77-240E RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/19/95 TIME 12:23	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 733.8 MM HG (28.89 IN HG)	CVS: 73.0°F RH 65.0 PCT AH 82.6 GR/LB	ENGINE DEW PT. 15.9°C (60.6°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 11.7 G/KG (82.2 GR/LB)	NOX HUMIDITY C.F. 1.019
		DRY-TO-WET C.F. .976

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	43.58 (1538.7)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	217.9 (7694.)
HC SAMPLE METER/RANGE/PPM	.4/ 13/ 8.20
HC BCKGRD METER/RANGE/PPM	5.2/ 2/ 5.20
CO SAMPLE METER/RANGE/PPM	3.4/ 12/ 3.22
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	71.2/ 11/ .6019
CO2 BCKGRD METER/RANGE/PCT	6.7/ 11/ .0391
NOX SAMPLE METER/RANGE/PPM (D)	3.5/ 13/ 72.60
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	22.57
HC CONCENTRATION PPM	3.23
CO CONCENTRATION PPM	3.12
CO2 CONCENTRATION PCT	.5646
NOX CONCENTRATION PPM	70.27
HC MASS GRAMS	.404
CO MASS GRAMS	.791
CO2 MASS GRAMS	2250.60
NOX MASS GRAMS	29.836
FUEL KG (LB)	.708 (1.56)
KW HR (HP HR)	3.13 (4.20)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.129(	.096) (	.10)	(CONT)
BSCO G/KW HR (G/HP HR)	.252(	.188) (	.19)	
BSNOX G/KW HR (G/HP HR)	9.527(	7.104) (	7.10)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.226(	.372)		
WORK KW HR (HP HR)	3.13(	4.20)		
BSCO2 G/KW HR (G/HP HR)	719. (	536.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST ORP-79-200E RUN
DATE 4/24/95 TIME 12:10
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 744.2 MM HG (29.30 IN HG)
ENGINE AIR TEMP. 23.3°C (74.0°F)

CVS: 70.0°F RH 33.0 PCT AH 37.1 GR/LB
ENGINE ABS. HUM. 9.5 G/KG (66.7 GR/LB)

ENGINE DEW PT. 12.9°C (55.3°F)
NOX HUMIDITY C.F. .979
DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	299.9
TOT. BLOWER RATE SCMM (SCFM)	44.18 (1559.9)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.8 (7797.)
HC SAMPLE METER/RANGE/PPM	5.3/ 13/ 111.40
HC BCKGRD METER/RANGE/PPM	4.2/ 2/ 4.20
CO SAMPLE METER/RANGE/PPM	3.7/ 12/ 3.51
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	59.5/ 11/ .4719
CO2 BCKGRD METER/RANGE/PCT	6.5/ 11/ .0378
NOX SAMPLE METER/RANGE/PPM (D)	2.6/ 13/ 54.93
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	28.16
HC CONCENTRATION PPM	107.35
CO CONCENTRATION PPM	3.35
CO2 CONCENTRATION PCT	.4354
NOX CONCENTRATION PPM	53.56
HC MASS GRAMS	13.616
CO MASS GRAMS	.861
CO2 MASS GRAMS	1758.80
NOX MASS GRAMS	22.138
FUEL KG (LB)	.567 (1.25)
KW HR (HP HR)	2.29 (3.07)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	5.948(4.435) (4.44) (CONT)
BSCO G/KW HR (G/HP HR)	.376(.280) (.28)
BSNOX G/KW HR (G/HP HR)	9.670(7.211) (7.21) (CONT)
BSFC KG/KW HR (LB/HP HR)	.247(.407)
WORK KW HR (HP HR)	2.29(3.07)
BSCO2 G/KW HR (G/HP HR)	768. (573.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST ORP-79-220E RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/24/95 TIME 12:43	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	
BAROMETER 744.2 MM HG (29.30 IN HG)	CVS: 70.0°F RH 33.0 PCT AH 37.1 GR/LB	ENGINE DEW PT. 13.2°C (55.7°F)
ENGINE AIR TEMP. 23.3°C (74.0°F)	ENGINE ABS. HUM. 9.7 G/KG (67.7 GR/LB)	NOX HUMIDITY C.F. .981
		DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.01 (1553.9)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.1 (7772.)
HC SAMPLE METER/RANGE/PPM	2.7/ 13/ 56.15
HC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.30
CO SAMPLE METER/RANGE/PPM	2.2/ 12/ 2.08
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	61.4/ 11/ .4920
CO2 BCKGRD METER/RANGE/PCT	6.7/ 11/ .0391
NOX SAMPLE METER/RANGE/PPM (D)	3.1/ 13/ 63.93
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	27.34
HC CONCENTRATION PPM	50.08
CO CONCENTRATION PPM	1.95
CO2 CONCENTRATION PCT	.4544
NOX CONCENTRATION PPM	62.43
HC MASS GRAMS	6.332
CO MASS GRAMS	.500
CO2 MASS GRAMS	1829.78
NOX MASS GRAMS	25.790
FUEL KG (LB)	.581 (1.28)
KW HR (HP HR)	2.48 (3.32)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	2.558	(1.907)	(1.91)	(CONT)
BSCO G/KW HR (G/HP HR)	.202	(.150)	(.15)	
BSNOX G/KW HR (G/HP HR)	10.417	(7.768)	(7.77)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.235	(.386)		
WORK KW HR (HP HR)	2.48	(3.32)		
BSCO2 G/KW HR (G/HP HR)	739.	(551.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST ORP-79-240E RUN
DATE 4/24/95 TIME 1:07
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 743.5 MM HG (29.27 IN HG)
ENGINE AIR TEMP. 23.3°C (74.0°F)

CVS: 70.0°F RH 33.0 PCT AH 37.1 GR/LB
ENGINE ABS. HUM. 9.7 G/KG (67.8 GR/LB)

ENGINE DEW PT. 13.2°C (55.7°F)
NOX HUMIDITY C.F. .982
DRY-TO-WET C.F. .987

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.0
TOT. BLOWER RATE SCMM (SCFM)	44.03 (1554.7)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.2 (7774.)
HC SAMPLE METER/RANGE/PPM	1.3/ 13/ 26.34
HC BCKGRD METER/RANGE/PPM	5.2/ 2/ 5.20
CO SAMPLE METER/RANGE/PPM	1.0/ 12/ .94
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	65.2/ 11/ .5334
CO2 BCKGRD METER/RANGE/PCT	6.6/ 11/ .0385
NOX SAMPLE METER/RANGE/PPM (D)	3.7/ 13/ 76.87
NOX BCKGRD METER/RANGE/PPM	.6/ 2/ .60
DILUTION FACTOR	25.39
HC CONCENTRATION PPM	21.34
CO CONCENTRATION PPM	.83
CO2 CONCENTRATION PCT	.4965
NOX CONCENTRATION PPM	75.27
HC MASS GRAMS	2.699
CO MASS GRAMS	.214
CO2 MASS GRAMS	1999.68
NOX MASS GRAMS	31.107
FUEL KG (LB)	.631 (1.39)
KW HR (HP HR)	2.91 (3.90)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	.928(	.692) (	.69)	(CONT)
BSCO G/KW HR (G/HP HR)	.074(	.055) (	.05)	
BSNOX G/KW HR (G/HP HR)	10.696(	7.976) (	7.98)	(CONT)
BSFC KG/KW HR (LB/HP HR)	.217(	.357)		
WORK KW HR (HP HR)	2.91(	3.90)		
BSCO2 G/KW HR (G/HP HR)	688. (	513.)		

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER	TEST ORP-80-200F RUN	DIESEL 2D EM-1852-F
ENGINE MODEL 93 CATERPILAR3116	DATE 4/25/95 TIME 2:11	HCR 1.80 FID RES. FAC. 1.000
ENGINE 6.6 L(403. CID) 6	COMPUTER PROGRAM HDT 3.3-R	H .131 C .869 O .000 X .000
ENGINE CYCLE DIESEL	CELL 1 BAG CART 1	ENGINE OIL
ENGINE SERIAL 2BK30968	AR NO. 6I2481	

BAROMETER 741.9 MM HG (29.21 IN HG)	CVS: 71.0°F RH 38.0 PCT AH 43.7 GR/LB	ENGINE DEW PT. 10.0°C (50.0°F)
ENGINE AIR TEMP. 24.4°C (76.0°F)	ENGINE ABS. HUM. 7.8 G/KG (54.9 GR/LB)	NOX HUMIDITY C.F. .950
		DRY-TO-WET C.F. .986

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	44.17 (1559.6)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.9 (7801.)
HC SAMPLE METER/RANGE/PPM	29.3/ 13/ 609.59
HC BCKGRD METER/RANGE/PPM	5.7/ 2/ 5.70
CO SAMPLE METER/RANGE/PPM	6.2/ 12/ 5.90
CO BCKGRD METER/RANGE/PPM	.8/ 12/ .76
CO2 SAMPLE METER/RANGE/PCT	55.3/ 11/ .4286
CO2 BCKGRD METER/RANGE/PCT	7.2/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM (D)	2.7/ 13/ 55.55
NOX BCKGRD METER/RANGE/PPM	.7/ 2/ .70
DILUTION FACTOR	27.77
HC CONCENTRATION PPM	604.09
CO CONCENTRATION PPM	5.06
CO2 CONCENTRATION PCT	.3880
NOX CONCENTRATION PPM	54.11
HC MASS GRAMS	76.660
CO MASS GRAMS	1.301
CO2 MASS GRAMS	1568.27
NOX MASS GRAMS	21.724
FUEL KG (LB)	.570 (1.26)
KW HR (HP HR)	2.15 (2.88)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	35.695(26.618) (26.62) (CONT)
BSCO G/KW HR (G/HP HR)	.606(.452) (.45)
BSNOX G/KW HR (G/HP HR)	10.116(7.543) (7.54) (CONT)
BSFC KG/KW HR (LB/HP HR)	.265(.436)
WORK KW HR (HP HR)	2.15(2.88)
BSCO2 G/KW HR (G/HP HR)	730. (545.)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST ORP-80-220F RUN
DATE 4/25/95 TIME 2:44
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 741.7 MM HG (29.20 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 73.0°F RH 36.0 PCT AH 44.6 GR/LB
ENGINE ABS. HUM. 7.8 G/KG (54.9 GR/LB)

ENGINE DEW PT. 10.0°C (50.0°F)
NOX HUMIDITY C.F. .950
DRY-TO-WET C.F. .985

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.99 (1553.4)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	220.0 (7769.)
HC SAMPLE METER/RANGE/PPM	13.4/ 13/ 278.51
HC BCKGRD METER/RANGE/PPM	9.6/ 2/ 9.60
CO SAMPLE METER/RANGE/PPM	9.1/ 12/ 8.69
CO BCKGRD METER/RANGE/PPM	.0/ 12/ .00
CO2 SAMPLE METER/RANGE/PCT	66.0/ 11/ .5423
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM (D)	2.7/ 13/ 55.98
NOX BCKGRD METER/RANGE/PPM	.9/ 2/ .90
DILUTION FACTOR	23.84
HC CONCENTRATION PPM	269.31
CO CONCENTRATION PPM	8.50
CO2 CONCENTRATION PCT	.5032
NOX CONCENTRATION PPM	54.27
HC MASS GRAMS	34.039
CO MASS GRAMS	2.176
CO2 MASS GRAMS	2025.44
NOX MASS GRAMS	21.706
FUEL KG (LB)	.671 (1.48)
KW HR (HP HR)	2.46 (3.30)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	13.833	(10.315)	(10.31) (CONT)
BSCO G/KW HR (G/HP HR)	.884	(.660)	(.66)
BSNOX G/KW HR (G/HP HR)	8.821	(6.578)	(6.58) (CONT)
BSFC KG/KW HR (LB/HP HR)	.273	(.449)	
WORK KW HR (HP HR)	2.46	(3.30)	
BSCO2 G/KW HR (G/HP HR)	823.	(614.)	

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CARB S.S. ENGINE EMISSION RESULTS PROJECT NO. 08-5744-010

ENGINE NUMBER
ENGINE MODEL 93 CATERPILAR3116
ENGINE 6.6 L(403. CID) 6
ENGINE CYCLE DIESEL
ENGINE SERIAL 2BK30968

TEST ORP-80-240F RUN
DATE 4/25/95 TIME 3:03
COMPUTER PROGRAM HDT 3.3-R
CELL 1 BAG CART 1
AR NO. 6I2481

DIESEL 2D EM-1852-F
HCR 1.80 FID RES. FAC. 1.000
H .131 C .869 O .000 X .000
ENGINE OIL

BAROMETER 741.4 MM HG (29.19 IN HG)
ENGINE AIR TEMP. 24.4°C (76.0°F)

CVS: 74.0°F RH 34.0 PCT AH 43.0 GR/LB
ENGINE ABS. HUM. 7.9 G/KG (55.6 GR/LB)

ENGINE DEW PT. 10.2°C (50.3°F)
NOX HUMIDITY C.F. .952
DRY-TO-WET C.F. .984

BAG RESULTS

BAG NUMBER	1
TIME SECONDS	300.1
TOT. BLOWER RATE SCMM (SCFM)	43.93 (1551.3)
TOT. 90MM RATE SCMM (SCFM)	.00 (.00)
TOT. 20X20 RATE SCMM (SCFM)	.00 (.0)
TOT. AUX. SAMPLE RATE SCMM (SCFM)	.00 (.00)
TOTAL FLOW STD. CU. METRES(SCF)	219.7 (7759.)
HC SAMPLE METER/RANGE/PPM	7.1/ 13/ 148.77
HC BCKGRD METER/RANGE/PPM	10.1/ 2/ 10.10
CO SAMPLE METER/RANGE/PPM	8.6/ 12/ 8.20
CO BCKGRD METER/RANGE/PPM	.1/ 12/ .09
CO2 SAMPLE METER/RANGE/PCT	74.2/ 11/ .6377
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0433
NOX SAMPLE METER/RANGE/PPM (D)	3.1/ 13/ 65.31
NOX BCKGRD METER/RANGE/PPM	1.0/ 2/ 1.00
DILUTION FACTOR	20.83
HC CONCENTRATION PPM	139.15
CO CONCENTRATION PPM	7.93
CO2 CONCENTRATION PCT	.5965
NOX CONCENTRATION PPM	63.34
HC MASS GRAMS	17.564
CO MASS GRAMS	2.028
CO2 MASS GRAMS	2397.74
NOX MASS GRAMS	25.338
FUEL KG (LB)	.772 (1.70)
KW HR (HP HR)	2.83 (3.79)

TOTAL RESULTS

BSHC G/KW HR (G/HP HR)	6.215(4.634) (4.63) (CONT)
BSCO G/KW HR (G/HP HR)	.718(.535) (.54)
BSNOX G/KW HR (G/HP HR)	8.965(6.686) (6.69) (CONT)
BSFC KG/KW HR (LB/HP HR)	.273(.449)
WORK KW HR (HP HR)	2.83(3.79)
BSCO2 G/KW HR (G/HP HR)	848. (633.)